SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXV.—No. 14. ESTABLISHED 1845. NEW YORK, OCTOBER 3, 1896. $3.00 A YEAR. WEEKLY.

GOVERNMENT DRY DOCK AT PORT ORCHARD, PUGET SOUND, WASHINGTON.

BY A. M'L. HAWKS, C.E.

By the successful docking of the United States steamer Monterey on April 22 of this year, the official test of the Government Dry Dock at Port Orchard, Washington, was made under the supervision of a commission consisting of Capt. Ludlow of the Monterey and Naval Constructor Baxter and Engineer Matson of the Mare Island Navy Yard. Plans and specifications for this dock were drawn under Mr. T. Endicott, C.E., U.S.N., of the Bureau of Yards and Docks. F. C. Prindle, C.E., U.S.N., has been in direct charge of construction.

The new dock, which is 675 feet long by 130 feet wide on coping, and 579 feet long by 67 feet wide on the bottom, is the largest on the Pacific coast, and is at present the largest in the United States (the Brooklyn dock when completed will be 20 feet longer, but will have 2 feet less water over the sill) and it takes rank as one of the big docks of the world. It will give this government pre-eminence in Pacific waters, as it alone can dock any vessel now afloat, avoiding a visit to Atlantic waters. In point of size it is considerably larger than its nearest competitors on the Pacific coast, being about 140 feet longer than the Mare Island dock, and 200 feet longer than the Esquimault dock (near Victoria, B.C.), while as to cost, it was but about $600,000, as compared with $3,000,000 for each of the others.

The work has been carried out by Byron Barlow & Company, of Tacoma, Washington, under contract dated October 29, 1892. The original contract was for a dock 529 feet long by 67 feet wide, and called for completion in 36 months. In March, 1893, it was supplemented by an agreement for lengthening the dock 50 feet, with a time allowance of 3½ months; and again, in July, 1893, some modifications were made and extra work added, with a further time allowance of 4 months. The original contract has been completed (together with the first supplement) for some time, and work under the second supplement is approaching completion, everything pertaining to the dock itself being finished.

The dock is built entirely of wood, save the concrete in the floor foundation and the concrete and masonry entrance. The entrance sill is of green sandstone, with a dressed granite gate seat facing of the massive masonry type, upon a concrete foundation of monolithic form resting on a pile and stringer grillage. The clear opening of the entrance is 92 feet wide, with 30 feet depth of water over the sill at mean high water.

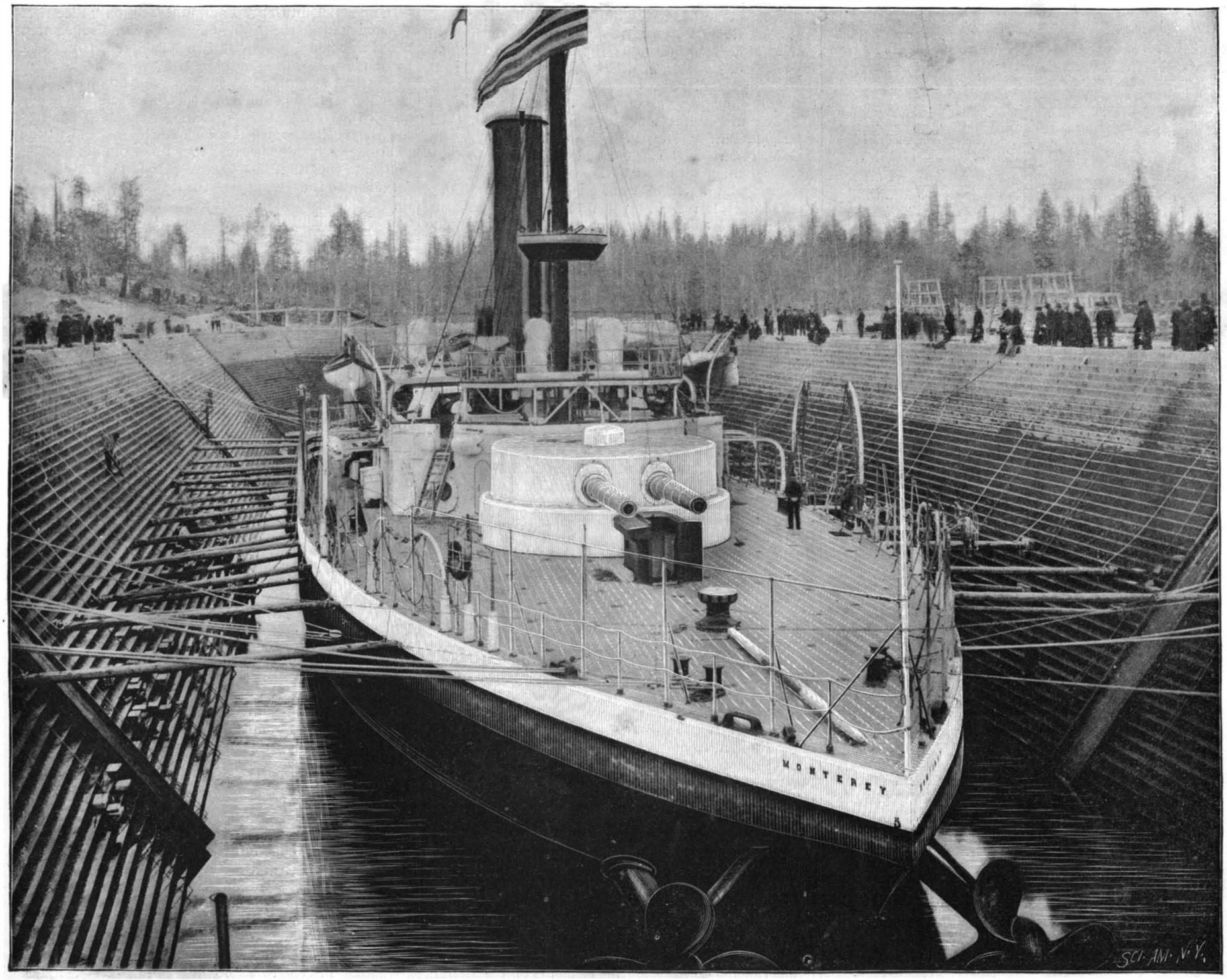
The bottom of the dock rests on about 8,000 piles, driven in a solid cluster down the center of the dock, where the keel blocks rest; and in rows 4 feet between centers laterally and 3 feet between centers longitudinally over all the remainder of the bottom.

These piles are capped with 12 inch × 12 inch longitudinal stringers, drift-bolted to the piles; and crossing these stringers are lateral timbers 14 inches × 16 inches, each being 72 feet long, the full width of the dock. Under this timber grill is a system of drains leading to the pump well. A mass of concrete 3 feet thick fills all the spaces in the grill to the level of the middle of the top timbers and forms the floor of the dock. A false floor of 3 inch plank is laid with a 7 inch space between the concrete and the planking, and with ½ inch spacing between planks, for the purpose of readily drying the working floor. Sheet piling was driven, completely encircling the bottom of the dock, to prevent leakage.

The sides of the dock are founded on piles driven at an angle of about 30 degrees from the vertical, in rows 4 feet between centers laterally and 9 feet between centers up the slopes. Upon these piles are 10 inch × 14 inch timbers standing on the incline of the side walls of the dock, securely tied to the lower part of the piles by braces, and butting against the 14 inch × 16 inch lateral timbers in the bottom. Clay puddle is filled in to the level of these timbers, and directly on them are fastened the 11 inch × 11 inch stringers which form the altar steps of the dock. About 25 feet back from the top of the sides of the dock is driven another row of sheet piling entirely around the sides and end, to prevent any surface seepage down behind the altars.

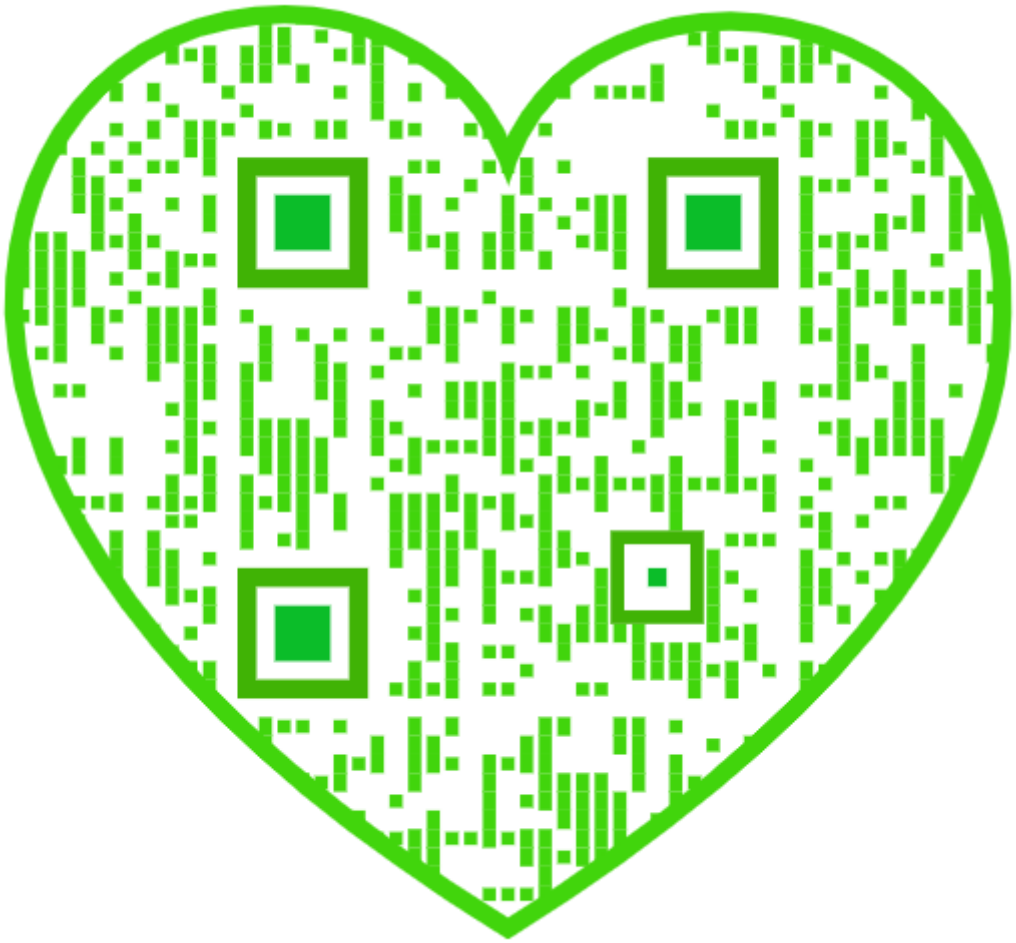
The caisson gate which closes the entrance of the dock is the largest in the world. It has a length of 94·9 feet; breadth at top, 13 feet; extreme moulded breadth, 24 feet; and extreme depth, 39 feet. It is in the shape of a double ended boat, built of steel, having its greatest breadth at about one-half of its height. It has a top deck of wood, and a main and lower decks of steel. The top deck is clear, save for a windlass and the funnel of the boiler. On the main and lower decks are the boiler, engine and centrifugal pump,

(Continued on page 266.)



THE UNITED STATES STEAMER MONTEREY IN THE NEW DRY DOCK ON PUGET SOUND.

© 1896 SCIENTIFIC AMERICAN, INC.



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.
(Established 1845.)

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union 4 00

Remit by postal or express money order, or by bank draft or check.

MUNN & CO., 61 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement
(Established 1876)

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year.*

Building Edition of Scientific American.
(Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders and all who contemplate building this work is invaluable.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Export Edition of the Scientific American
(Established 1878)

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," a Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 100 pages, profusely illustrated. It is the finest scientific industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies, 25 cents.

MUNN & CO., Publishers, 361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, OCTOBER 3, 1896.

Contents.

(Illustrated articles are marked with an asterisk.)

Balloon, a new dirigible*..... 271
Balloons, military..... 266
Band saw guide, Martin's*..... 264
Bicycle notes..... 270
Books and publications new..... 273
Building, a novel plan of..... 266
Candles in China..... 269
Catacombs, Mexican*..... 264
Celluloid for splints..... 264
Characters, acquired, inheritance of..... 268
Chinese post office, the..... 267
Disinfecting at New York*..... 268
Dry dock, Puget Sound*..... 261
Dust storm, load of a..... 263
Electric sucker, the..... 262
Employer's liability..... 272
Engineering, art element in..... 262
Flowers, heat of..... 262
Forge and bench..... 272
Guns, remarkable projected..... 263
Hair bleach (6965)..... 273
Health Board, N. Y., disinfecting boat*..... 268
Heavens for October, the..... 263
Hippopotami, Paris*..... 265
Ice, weighing by measure..... 271
India rubber and gutta percha..... 267
Inventions recently patented..... 272
Jerusalem, excavations at..... 265
Lifeboat, the William F. James*..... 268
Marble quarries, Carrara..... 265
Markets, foreign, how to win..... 269
Motor carriages for postal service..... 272
Mustard plasters..... 264
Northland, steamer, under water..... 263
Petroleum for fuel..... 262
Phosphorescence in development..... 263
Rail fastening, Wilson's*..... 264
Repose, the posture of..... 271
Sahara, future of the..... 266
Science notes..... 270
Sculpture, religious origin of..... 266
Silver mining and reducing..... 270
Sulphur furnace for disinfecting*..... 269
Tooth soap (6964)..... 273
Valves, bicycle..... 270
World's Fair buildings, fate of the..... 267

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1083.

For the Week Ending October 3, 1896.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ASTRONOMY.—The National Observatory at Paris and the Astro-Physical Observatory at Meudon.—The famous old observatory of Paris and the recently erected observatory at Meudon.—2 illustrations..... 17307

II. AUTOCARS.—The Vallee Gasoline Carriage.—A recently exhibited motor carriage with tubular frame and gasoline explosion motor.—Description of a special tire by the same inventor.—2 illustrations..... 17311

III. ELECTRICAL ENGINEERING.—An Electric Dredger.—A floating dredger built in Rotterdam from Spanish designs for use on the Esla River, Spain, designed to be worked from shore by electric transmission of energy.—1 illustration..... 17310

IV. ENGINEERING.—The Artistic Element in Engineering.—A vice-presidential address before the section of Mechanical Appliance and Engineering of the American Association.—A very suggestive and practical paper..... 17311

V. MECHANICAL ENGINEERING.—The London Sanitary and General Engineering Exhibition.—New forms of hydro-extractors are shown.—2 illustrations..... 17316

VI. MINERALOGY.—Precious Stones.—By Prof. HENRY A. MIERS.—Lecture II.—Conclusion of this most interesting paper describing lecture experiments with minerals to demonstrate their properties.—2 illustrations..... 17308
The Largest Diamond.—Popular account of the largest diamond ever found.—A specimen available for mechanical purposes only.—1 illustration..... 17309

VII. MISCELLANEOUS.—Lost Arts and Recipes.—A description of recipes that have been supposed to have been lost to human knowledge.—A fascinating subject popularly treated..... 17313
The Tamers and Trainers of Wild Animals.—A graphic account of trained animals and incidents of the trade therein.—3 illustrations..... 17306
Selected Formulæ..... 17313
Engineering Notes..... 17314
Electrical Notes..... 17314
Miscellaneous Notes..... 17314

VIII. MUSICAL INSTRUMENTS.—The Rivoire Music Registering Apparatus.—A mechanical stenograph of musical thought.—2 illustrations..... 17317

IX. NAVAL ENGINEERING.—Electric Turret for Armorclads.—The application of electricity for working a ship's turret as carried out by the famous French gun builder Canet.—2 illustrations 17310

X. ORNITHOLOGY.—The Migration of Birds.—By CHARLES DIXON.—An interesting description of this phenomenon of bird life.—Descriptions of observations made at lighthouses..... 17305

XI. PHOTOGRAPHY.—A Naturalist's Camera.—1 illustration..... 17318
Portable Photographic Lantern.—1 illustration..... 17318

XII. TECHNOLOGY. Apparatus for the Manufacture of Acetylene Gas.—A continuation of a valuable article describing some of the leading forms of generators.—4 illustrations..... 17315

XIII. TRAVEL AND EXPLORATION.—Li Hung Chang's Trip Around the World.—Some of the incidents of the Chinese statesman's journey.—Anecdotes about the introduction of railroads into China.—13 illustrations..... 17303

THE ARTISTIC ELEMENT IN ENGINEERING.

Although we have recently spoken at some length on the question of the artistic element in engineering, we feel that the subject is of such practical importance as to warrant this early return to it. At the recent meeting of the American Association for the Advancement of Science, held in Buffalo, Prof. Frank O. Marvin made this matter the subject of a lengthy and admirable address, which will be found in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT.

It is gratifying, but not a matter for surprise, that the interest in this question, which has recently been awakened, or rather reawakened, by Commissioner Wales' suggestions regarding the new East River Bridge, New York, has met with a hearty response from engineers and the technical press in general. That there is no necessary antagonism between that which is useful and that which is artistic is a fact which appears to be now generally understood, and the day is coming when it will be realized that these two elements are, in the nature of things, closely associated in the best works of construction.

Prof. Marvin defines the three elements of design as the scientific, the æsthetic, and the financial, and claims that "the current engineering practice gives great attention to the first and last of these elements, but little comparatively to the second." While admitting the truth of this statement, it is but just to say that the fault does not lie with the engineer so much as in the conditions under which he works. The final voice which the financial element too often has in the determination of designs and the awarding of contracts has tied the engineer down to a hard and fast consideration of the scientific elements of design alone. His knowledge is directed to a calculation of the least possible amount of material that will serve the purpose; and the general outlines into which he forms his design are determined by the same considerations. When the boards which control our public works and the management of the great industrial corporations make it clearly understood that, in judging competitive designs and awarding contracts, the artistic element will receive its full share of consideration, we shall see a marked effect upon engineering work as a whole. While a structure which is designed upon purely utilitarian lines will always have a certain beauty in the eyes of the professional man, who understands the meaning of its proportions, it does not follow that its outline will commend itself to the eye of the artist. Indeed, judging from the criticism in which those who profess to be artistically gifted more often than not indulge when speaking of engineering works, it would seem as though a design which is essentially scientific, and nothing more, can scarcely escape being essentially ugly. After making allowance, however, for the tendency to exaggeration which seems to be inseparable from artistic criticism, whether it be directed to a china vase or a steel viaduct, it remains true that the most scientific construction is not necessarily the most beautiful, and that a design whose proportions and details are modified by abstract considerations of grace and beauty will probably cost something more, often considerably more, than one which is purely utilitarian—designed for the simple doing of useful work, without any regard for its appearance.

If the three elements of design, the scientific, the æsthetic, and the financial, were placed in the order in which, historically speaking, they have successively controlled the art of engineering in America, we should say that originally the financial element was the controlling influence. In the early days of engineering, when there was so much to be done and so little capital to do it with, considerations of imperative economy came first, and design had to be subordinated to the materials of construction. Where timber was cheap and metal dear, the more cumbersome material was freely used; and from the same motives of economy the more bulky cast iron was placed where wrought iron or steel would have given equally reliable service and afforded a lighter and more artistic appearance. With the coming of the age of steel, and a more generous supply of capital, engineering developed more exact scientific methods. The old method of design, which was largely experimental and of the rule-of-thumb order, gave place to the formula and the testing machine. So thoroughly have American engineers worked out the scientific method that they have evolved certain types of construction which are strikingly different from anything to be found in any other part of the world. Indeed, it is safe to say, that for illustrations of the strictest application of theoretical science to the art of construction, one must come to America.

Having said this much, it must be admitted, on the other hand, that, judged from the standpoint of artistic merit, our engineering works do not equal those of France, at least in the department of civil engineering. The Frenchman is an artist to his finger tips, and he has shown the world that in the erection of great public works it is possible to produce dignity of outline, harmony of proportions, and beauty of detail, without doing violence to the scientific elements of the design. Our engineers are masters of the science of design, and there is no race that can build so swiftly or at less cost than we. It remains for us to develop that taste for the beautiful, and that mastery of its principles, which is the crowning glory of a race of builders, whatever be their age or clime.

Consumption of Petroleum for Fuel.

No official figures on the consumption of petroleum for fuel have been published since the statement presented in the columns of the Shipping and Commercial List on January 17, 1894. Then it was shown that the Ohio and Indiana oil fields had furnished for fuel purposes 7,000,000 barrels crude in 1890, a trifle over 9,500,000 in 1891, about 11,000,000 in 1892, and 9,000,000 in 1893. The consumption dropped to 8,000,000 barrels in 1891, and last year the total sales of fuel were 7,600,000 barrels. Since January 1 the movement of crude for that purpose has continued at about the same ratio. The decline is owing to reduced production and higher prices. In 1892, when consumption was at its highest point and producers were pushing the use of oil for fuel, the cost of Lima oil at the wells was 15 cents per barrel, in comparison with 72 cents as the average last year. The decreased yield of Pennsylvania crude compelled refiners to give more consideration to the so-called Lima oil. By improved processes they brought the Ohio refined to perfection, and it is now as acceptable for export as any other grade of petroleum. For that reason much less crude is used for fuel, and unless production should largely increase, the volume of business in fuel oil will continue to decrease, so far as the Ohio and Indiana fields are concerned.

A different story comes from California, where the production last year was 800,000 barrels, against 400,000 in 1894, half of which was used for fuel and the balance refined. Developments are rapidly increasing the oil wealth of that State, and until the oil is otherwise used great efforts are being made to push it forward as a fuel. It is now being used in locomotives with success, this feature being taken from Russia. The comparatively new fuel is meeting with favor on the Pacific coast, as it cheapens the cost materially to many industries and prevents a surplus.

The Electric Sucker.

In an article in Ueber Land und Meer on "Electrical Phenomena in the Animal World," Dr. Frölich tells about a sucker first found in the Nile and its tributaries by modern scientific men in 1881, but well known to the ancient Egyptians as the "sucker thunderer god," being worshiped as such in a sucker god temple in the city of the thunder sucker, or Oryrrhynchos. The reason they called it the thunder sucker instead of the "thunder fish," was because they knew of another fish, known to the English-speaking people as the electric cat (fish), to the Germans as the Zitterwels, or the shad that makes one tremble. It grows to a length of about a foot, of which the head and nose take up a quarter, and at the deepest part measures more than a quarter of its length.

Just why the modern scientific men did not know of this fish before is a question a layman finds it hard to answer, except that the sucker is a bottomy fish. The old Egyptians probably learned of the animal after a Nile flood, when some philosopher was meditating over a mud puddle left by the receding water. He saw a funny fish struggling in the water, and, out of a desire for knowledge, reached for the fish and touched it. If there were any disciples of the philosopher hard by, they probably saw the philosopher act surprisingly—as the stoic Indian did when he got hold of a galvanic battery. Thereafter the fish was worshiped, having a name which associated it with the "thunder god of the skies," although the ancients knew nothing of electricity according to the learned of to-day.

A peculiar thing about the various electrical fish is that should one swim, even at a considerable distance from a human bather, the bather would know of its proximity by an "electrical sensation," while many of them have batteries actually fit to kill a horse on contact. These fish are far ahead of human beings in the matter of weapons, "for they stun their prey at a great distance in the water."

Heat of Flowers.

Herr G. Kraus has investigated the extent and purpose of the rise of temperature at the time of flowering within the spathe of various species of Acaceæ, Cycadeæ and Palmæ. In Ceratozamia longifolia he found this elevation to take place only in the daytime, the maximum attained being 38·5° C., or 11·7° above that of the air. Similar results were obtained with Macrozamia. In the Acaceæ examined the period of maximum elevation is more variable, but it is never in the night. In this order the seat of the elevation of temperature is not the reproductive organs themselves, but the club-shaped appendix to the inflorescence, and it is accompanied by a rapid consumption of starch and sugar. All the plants in which this phenomenon occurs are entomophilous, and Dr. Stahl sees in it a contrivance for attracting insects to assist in pollination.—Annales Jard. Bot. Buitenzorg, 1896.

© 1896 SCIENTIFIC AMERICAN, INC.

THE HEAVENS FOR OCTOBER.

BY WILLIAM R. BROOKS, M.A., F.R.A.S.

MERCURY.

Mercury is evening star at the opening of the month, but too near the sun for observation. It comes into inferior conjunction on October eighth at four o'clock, when it will be between the earth and sun. It then changes to morning star, and, pursuing its fleet onward course, it reaches its greatest western elongation 18° 26′ on the twenty-fourth of the month, at 7 o'clock in the morning. This will be the best time to observe Mercury as morning star, say for about a week before and after the 24th inst. Mercury will be in conjunction with the moon on the night of October sixth, when Mercury will be 2° north of the moon, which became new only seven hours before.

VENUS.

Venus is also evening star, and will begin to shine resplendently in the western gloaming during October. It is moving rapidly out from the sun's rays, and will be a conspicuous object for the rest of the year. By the middle of October it will set an hour and a half after the sun. Venus will be in conjunction with the beautiful two-days old moon on the eighth at 4 o'clock in the afternoon, Venus being 5° 18′ north of the moon. It will be in conjunction with Uranus on the early morning of the nineteenth, Venus being south of Uranus less than three-quarters of a degree.

MARS.

This exceedingly interesting planet, which comes into opposition on the tenth of December next, and will then be at its nearest approach to the earth at their opposition, may now be well observed by midnight. On the first of the month it will be at a good elevation at that hour, and by the last of October will be in excellent position for telescopic scrutiny. Its high northern declination is very favorable for good definition.

Already the great telescopes are turned toward this planet, and many of its markings have been seen to wonderful advantage. Not only have the so-called canals been seen, but their duplication, a feature so long maintained by the able Italian astronomer Schiaparelli alone, has been proved beyond a doubt. As opposition approaches, and the planet comes nearer to us, small telescopes of four to six inches aperture will reveal much to the persevering observer.

About the 1st of October Mars is fifteen degrees east by north of Aldebaran, which star it now greatly surpasses in brilliancy. Its rapid movement from night to night among the stars affords a splendid illustration of a planet's orbital motion. Mars will be in conjunction with the moon on the 26th of the month, when the planet will be three and one-half degrees south of the moon.

JUPITER.

Jupiter is in the morning sky, but, rising only about two hours before the sun, it is not well placed for telescopic observation. It is in conjunction with the moon on the 3d of the month, when it is one degree and forty minutes north of the moon, and again on the 31st, when it is two degrees and twenty-five minutes north of the moon.

SATURN, URANUS AND NEPTUNE.

Both Saturn and Uranus are low down in the western evening sky, and so near the sun as to be hidden from our view by his overpowering rays. Neptune is in the morning sky between the horns of Taurus, about two degrees west of the famous Crab nebula.

COMETS.

Three telescopic comets are now visible. Sperra's comet, discovered on August 31, and verified by the writer on September 4, is in Ursa Major, my latest observation being on September 9, when it was in right ascension 14h. 11m. 20s.; declination north 55° 6′. It is moving easterly.

Giacobini's comet was discovered at Nice, September 4. It is in Serpentarius, and its position at this writing is right ascension 17h. 40m.; declination south 9° 55′; moving southeast.

Brooks' periodic comet, discovered by the writer in 1889 and now returned to visibility after its seven years' journey around the sun, is apparently almost stationary in Aquarius, on the left thigh of that figure. The position of the comet on October 1 is right ascension 22h. 8m.; declination south 17° 29′. An illustrated article describing this comet was published in the SCIENTIFIC AMERICAN of August 22 of the present year.

Smith Observatory, Geneva, N. Y., September 18, 1896.

The Northland Under Water.

The cabin decks of the steamship Northland, of the Great Northern line, lie under water in the slip where she was laid up for the winter at Duluth, Minn. It is suspected that the seacocks were opened the night of September 21, by some one, probably discharged employes. The steamer cost $700,000, and is the finest on the lakes. The ruin of the interior decorations will make the loss considerable. She completed her season's trips between Duluth and Buffalo less than a fortnight ago.

Two Remarkable Guns for Coast Defense.

The United States Ordnance Board is about to construct two guns of 16 inch and 12 inch caliber, both of them experimental, and both possessing features of great interest and novelty. The 16 inch gun will be remarkable for its weight and power, which will give it an undisputed claim to the title of the biggest gun in the world; the 12 inch weapon, which is to be a Brown segmental wire-wound gun, is being built to ascertain whether the good results which were obtained with the 5 inch Brown gun, two years ago, can be repeated in a weapon of large caliber.

The 16 inch gun will be 50 feet in length, will weigh 125 tons, and will be capable of throwing a 2,370 pound projectile, with an initial velocity of 2,000 feet a second, to an extreme range of 16 miles. The charge of brown powder will weigh over half a ton. The outside diameter of the breech of the gun will be 5 feet 2 inches and the diameter of the breech opening 20 inches. The shell will be capable of penetrating 27½ inches of steel at a distance of two miles.

It will be noticed that while this is the most powerful gun in the world, its caliber is not so great as that of some existing guns. There is no necessary connection between the weight and power of a gun and its caliber.

There are a couple of old smooth bores in the vicinity of New York which already confer the distinction upon the United States government of possessing the largest calibered guns in existence, the diameter of the bore being 20 inches. Then, again, the English navy mounts some 16¼ inch rifled guns and the Italian navy some 17 inch guns, of modern construction, which are of considerably less power than the 16 inch gun now under construction at the Watervliet Arsenal.

There is only one big gun which will compare with the new weapon in power, and this is the 16½ inch Krupp breech loader exhibited at Chicago in 1893, which weighs 120 tons and fires a 2,204 pound shell with an initial velocity of 1,981 feet a second. Its muzzle energy is 60,002 foot tons, or 4,000 foot tons less than that of the Watervliet gun.

The comparative dimensions and performance of the great guns of the world are shown in the accompanying table:

Builders.	Caliber. Inch.	Length. Feet.	Weight of gun. Tons.	Weight of shell. Lb.	Muzzle velocity. Ft. sec.	Muzzle Energy. Ft. tons.	Penetration at muzzle.
Watervliet Arsenal	16	50	125	2,370	2,000	64,000	*33 in. steel
Krupp	16½	46	120	2,204	1,981	60,000	42 in. iron
Armstrong	16¼	43½	110½	1,800	2,087	54,390	37½ "
Armstrong	17	40	104	2,000	1,992	55,030	33½ "

* The equivalent penetration through iron would be about 4 feet.

At first thought it might seem that our government was taking a step backward in commencing the construction of these large guns at a time when foreign nations have abandoned them in favor of lighter weapons of 12 inch and 13 inch caliber; but, as a matter of fact, the conditions which put a stop to their construction have changed, and new conditions have arisen which call for these monster weapons to meet them. The 16¼ inch guns failed, not in their destructive effects, which were enormous, but because of certain structural defects, which caused them to sag at the muzzle after firing a limited number of rounds. The system of building up adopted in the manufacture of large guns in the United States will entirely prevent this weakness. Moreover, at the time when the large guns fell into disfavor it was found that guns of 12 inch and 13 inch caliber could be built which would effect an equal penetration through the best armor of that date.

To-day, however, the introduction of the Harvey system of manufacture has raised the resisting power of armor plate so greatly that it bids fair to become more than a match for the 13 inch gun. Even at the testing grounds, where the shell has everything in its favor, it can scarcely get through a reforged Harvey plate; and when it is delivered at a passing ship, where the range is less certain, the blow less direct, and the exact location of the armor not known, the chances of penetration are very slim. Now it is well understood that one successful penetration into the vitals of a ship is worth a dozen blows, however destructive, that fail to get through. It is here that the value of the 125 ton gun comes in. Its penetration is about 35 per cent greater than that of the 13 inch gun, and its energy, or the crushing in effect which it exerts upon the side of the ship, is nearly double; the energy of the 13 inch gun being 33,627 foot tons and that of the 16 inch gun 64,000 foot tons. The gun now under construction is strictly experimental, and some idea of the costliness of these huge weapons is gained from the fact that it will take three years to complete it.

The Ordnance and Fortification Board has recently made an allotment for a 12 inch Brown segmental wire-wound gun. This decision has been prompted by the successful tests of the 5 inch Brown gun two years ago, when 200 rounds were fired with very high pressures before any defect developed in the gun. Moreover, the British government has achieved such excellent results with their wire-wound guns, built on the Longridge system, that they have adopted a 12 inch gun of this type as the main armament of the fleet. In the wire-wound gun the metal of the inner tube or liner is thrown into a state of initial compression by the enormous tension at which the wire wrapping is wound upon it. By this means it is able to withstand much greater powder pressures than a gun of the built up, hooped construction. As a consequence, a wire-wound gun may be built of the same weight as a hooped gun which will have far greater energy and penetration. What the system has done in the English navy is shown in the following comparison of its 12 inch hooped and 12 inch wire guns.

Nature of Gun.	Weight.	Weight of Shell.	Muzzle Velocity.	Energy Developed.		
				At Muzzle.	Per Ton of Gun.	Per Pound of Powder.
	Tons.	Lb.	F. S.	F. T.	F. T.	F. T.
12 in. hooped gun	45	714	1,892	18,060	420	61
12 in. wire gun	46	850	2,323	31,800	691	212

From this comparison it is seen that for the same total weight of weapon the energy is nearly double in the wire-wound gun.

The peculiar feature of the Brown gun is that between the inner tube and the wire coil is a set of steel staves, or longitudinal segments, which are bound together by the steel wire "under a tension that will produce such a compression between the segments at their inner surface that they will not begin to open under ordinary powder pressures." The advantage of making the tube in segments is that a much higher quality of metal can be obtained than is possible in a solid tube. It will have the maximum longitudinal strength and a higher elastic limit for compression. Moreover, every segment may be carefully tested before it is put into the gun.

We hope to give a more detailed description of the Brown segmental gun in a later issue.

Phosphorescence in Development.

A. Helheim draws attention to this subject in the Photographisches Archiv. After reciting the experiments of Dr. Neuhauss in 1892, Dr. Precht in 1895, and those of Lenard and Wolff in 1888, he writes that he has had similar experience in studying the action of formaldehyde as a constituent of the developer. He made up a developer of—

Water	30 grammes.
Pyrogallic acid	1 gramme.
Carbonate of soda	1½ grammes.
Formaldehyde (40 per cent)	2 grammes.

The negative was over-exposed and fogged. After laying aside a few minutes, the plate was seen to glimmer, first at the edges and then toward the center. The light was bluish-white, and observable even in presence of the dark room lamp. The phosphorescence appeared as soon as all moisture was absorbed from the surface, and lasted several minutes. Thinking the absorption an important factor, as the phosphorescence was imperceptible while the plate was in the dish, the writer tried the effect of another absorber of water, and added 30 c. c. of alcohol to the developer. A very intense phosphorescence was at once visible. As it passed away, it could be revived by shaking the bottle. The addition of alcohol, of course, precipitated the carbonate of soda, and produced similar conditions to those in the experiments of Lenard and Wolff, who poured pyrogallic acid developer into an equal quantity of saturated solution of alum.—British Journal of Photography.

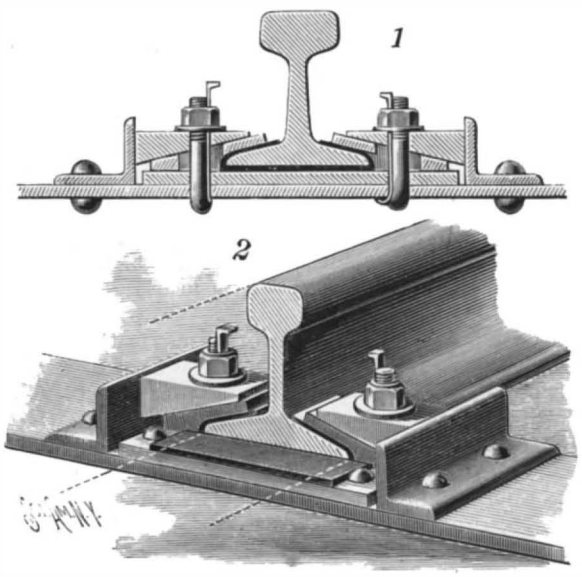
The Load of a Dust Storm.

Blown dust is a general and familiar nuisance to housekeepers over the entire West. A minimum estimate, verified by direct observation, for the quantity of dust settling on floors during such storms is about a fourteenth of an ounce of dust on a surface of a square yard in half a day. A maximum estimate made on the basis of the above newspaper accounts would be at least five pounds to a square yard of surface for a storm lasting twenty-four hours. If we then suppose that a house that is twenty-four feet wide and thirty-two feet long has open crevices, which average a sixteenth of an inch in width and have a running length in windows and doors of one hundred and fifty feet, the wind may be supposed to enter half of these crevices with a velocity of five miles per hour for the time the storm lasts, or for twenty-four hours. The dust may be supposed to settle on not less than eighty-five square yards of surface, including floor space and horizontal surfaces of furniture. The minimum estimate, based on these figures, gives us two hundred and twenty-five tons of dust to the cubic mile of air. The maximum estimate would be one hundred and twenty-six thousand tons.—From Dust and Sand Storms in the West, by Prof. J. A. Udden, in Appletons' Popular Science Monthly.

© 1896 SCIENTIFIC AMERICAN, INC.

AN IMPROVED RAIL FASTENING.

A fastening with which the rail may be readily adjusted laterally and longitudinally, the bolts being placed in position from above, is represented in the accompanying illustration. It has been patented by Francis W. Wilson, and the improvement is being introduced by the New York Rail Insulation and Equipment Company, of No. 200 Market Street, Newark, N. J., manufacturers of materials for track rail insulation which have been introduced on some large bridges and viaducts, and applicable on all structures where automatic electrical signal devices are in use. Fig. 1 shows a cross section of the improved fastening, Fig. 2 being a view in perspective. On the rail plate, which rests on a metallic or other support, is a sound-deadening or insulating material on which rests the base of the rail, each flange of which is engaged by a clip having an inclined surface, the sound-deadening or insulating material extending between the flange and the clip. The clip has an elongated aperture for the passage of a bolt, which also passes through an opening in an upper wedge-shaped clip whose base rests on an angle iron secured to the metallic support. The bolt has at its lower end a flange or projection, directly over which one side of the bolt is flattened, forming a pathway for a key, preferably of soft iron or steel, so that when the key is driven down at the side of the bolt the lower end of the key will be curved outward by the flange to form a retaining lip engaging the under side of the support. When the lip is thus formed, as indicated on the right of the rail in Fig. 1, the bolt is drawn up by screwing up the nut resting on a washer on the upper clip, whereby the rail clip is firmly secured in place. It is obvious that, by loosening the nut, the rail may be shifted longitudinally or laterally as desired.



WILSON'S RAIL FASTENING.

IN MEXICAN CATACOMBS.

For a man who is not finical as to what becomes of his body after death, and who wants to economize in point of funeral expenses, Mexico is about as good a country in which to shuffle off this mortal coil as any. In fact, it might be considered as quite the place for a gentleman in moderate circumstances to die, for there it is possible to get a third-class interment including all the advantages of a first-rate burial, without the possibility of your friends being a bit the wiser for at least five years. This is due to a system in vogue there of disposing of the dead, and while to the frugal man it offers some inducements, like all economy it is fraught with its inconveniences. One of these is that a cheap interment means only a lease on a grave, with the corpse subject to removal at its expiration, and were most of us to die in Mexico we would rather pay a little extra and revel in the luxury of perpetual burial.

In some parts of Mexico the cemetery or panteon is inclosed with a great wall, which is nothing more or less than a huge vault, persons being buried in its sides. This wall is partitioned or compartmented off for that purpose. The graves or cells are about two feet wide, two feet high and six feet long, and are leased or sold outright to any who may have use for them. For $25 you can rent a niche in the wall for five years, after which you must vacate for another tenant. Your bones are then thrown into a charnel house, in a heap with a lot of other old bones, unless you should have become mummified in the meanwhile, in which case you are labeled and stood up against the wall, more out of respect for your staying qualities than any deference to your person. There your friends and relatives can come and visit you. If they had any inclination to steal you, they could easily do it, as you will be found to weigh not over five pounds. However, for an extra $25 you can get another five years' lease on your grave, and for $100 down you can get a guarantee that your bones will never be touched.

The picture shown is the charnel house of the Panteon Municipal of the city of Guanajuato, Mexico. It is an excellent one and will give a fair idea of the grewsome catacombs which are quite common throughout that country. In the foreground are the mummies, or, to be really correct, "stiffs," as they are taken from the wall after their allotted time of burial. On their breasts can be distinctly seen the labels, telling who they are and from what niche they were removed. They are all known and called by their names when pointed out to visitors by those in charge. As can be seen in the illustration, that thoughtful-looking chap on the right was once a brilliant lawyer and a well known figure on the streets of Guanajuato.

A true story is told of a woman who, after her husband's death, married again. One day she was paying a visit to this charnel house when she recognized the mummy of her first love leaning up against the wall. She went into hysterics at the ghastly sight, and as a result of this visit No. 1 was given a continuous place in the wall.

There has been no reliable solution as yet for the cause of so many of these bodies mummifying, and as it seems to be a sort of kiln burning process that they go through, the question might present itself to the speculation of clay workers. In Mexico the sun is very hot, and it beats the livelong day on the wall of the panteon.

As the compartments containing the bodies are all hermetically sealed, this intense heat is supposed to be one of the causes in bringing about this mummified condition. Whether that is the case or not, they have certainly had a good burning when they are taken out, and it is yet to be decided whether the human clay is subject to vitrification in the right kind of a kiln.

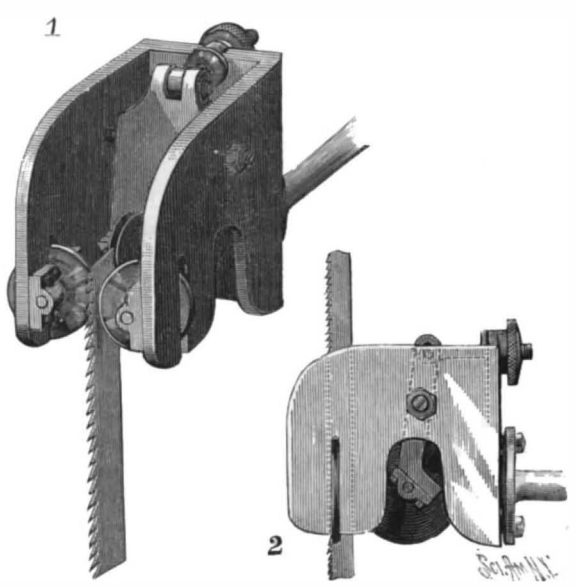
The foregoing facts were furnished to our contemporary Brick, to which we are indebted for the loan of the cut and particulars, by the Rev. J. C. Cartwright, of the Methodist Episcopal Mission, Guanajuato, Mexico, who spent five years in that country and recently returned to Chicago for his health. Mr. Cartwright has made a deep study of Mexican life and habits.

CURIOUS CATACOMBS IN MEXICO.

THE apparent diameter of the moon is greater in the Elorn valley (Finisterre, France), says Prometheus, than anywhere else. This is attributed to the high humidity of the air prevailing there.

A FRICTIONLESS BAND SAW GUIDE.

The illustration represents a band saw guide designed to be practically frictionless, and with which there can be no perceptible vibration of the saw, thus insuring a clear cut through the wood. The improvement has been patented by John A. Martin, of Morganfield, Ky. Fig. 1 shows the device in perspective, Fig. 2 being a side view. The rear end piece of the frame is attached to a shallow cone block by two set screws, and a guide wheel carrying frame has pivotal bearings on screws passed through tapped openings in the side pieces. The upper end of the guide wheel carrying frame is adjustable by a screw rotating in the back piece, and on the lower inclined end of this frame are boxings for the shaft of a grooved bearing wheel which engages the rear edge of the saw. Forward of this wheel are lateral guide or pressure disks adapted to bear against the sides of the saw blade, and, by means of the screws in the shallow cone block, these disks may be given a small amount of lead or adjustment toward or from the base of the saw teeth, to prevent the saw from being pulled out of its pulleys when backing out of the work.



MARTIN'S BAND SAW GUIDE.

Celluloid as a Material for Splints.

In the Centralblatt fur Chirurgie, says the New York Medical Journal, Prof. Landerer and Dr. E. Kirsch mention the great drawbacks of plaster of Paris as a splint material—its weight and its proneness to become foul by absorbing sweat, urine, etc. They say that in the Medico-mechanical Institute of Stuttgart celluloid has been found an excellent substitute free from these disadvantages. A wide mouthed bottle is packed for about a quarter of its height with celluloid cut into small pieces and then filled with acetone. It is provided with an airtight stopper to guard against evaporation. From time to time it is opened and the contents are stirred with a stick. The celluloid dissolves in course of time. A plaster cast of the diseased or injured part is covered with a moderately thick layer of felt or flannel, and the celluloid solution is rubbed into this covering with the hands, which are to be protected with leather gloves. This process should be repeated from four to six times. The advantages of the celluloid splints and corsets are their lightness, hardness, stability, elasticity, and cleanliness.

A MUSTARD plaster made according to the following directions will not blister the most sensitive skin: Two teaspoonfuls of mustard, two of flour, two of ground ginger. Do not mix too dry. Place between two pieces of old muslin and apply. If it burns too much at first, lay an extra piece of muslin between it and the skin; as the skin becomes accustomed to the heat, take the extra piece of muslin away.

© 1896 SCIENTIFIC AMERICAN, INC.

Carrara's Marble Quarries.

The British vice consul at Spezia, in a report on the Carrara marble industry, says that last year the production of the quarries was 108,951 tons of ordinary and statuary marble and 52,360 tons of sawn and worked marble.

The different kinds of marble in the market from the Massa-Carrara quarries are statuary or Carrara, properly so called; Sicilian, veined, dove, and peacock. There are a few colored quarries, but their product is insignificant. Massa produces some colored marble. There is a quality of marble, perhaps the most rare, and for some purposes the most beautiful, known as "pavonazzo," or peacock. It has a creamy ground with blood violet or purple markings or veins. Of the Sicilian (biancochiaro), blocks of almost any size can be obtained. It is only a question of transport. Blocks weighing as much as forty tons have been seen at Carrara. A quarry of red marble has lately been worked near Garfagnana.

The main valleys in which the quarries lie are the Ravaccione and Fantiscritti. To reach the Ravaccione a long valley of quarries has to be passed, at one end of which, named Crestola, the finest statuary marble is excavated, while at the other end the commonest "Sicilian" is found. Two explanations are given for naming the ordinary biancochiaro marble "Sicilian." One is that during the French occupation of Italy it was sent to Sicily and thence to England. The other that the vessels loading marble afterward went to Sicily to complete their cargoes with fruit, etc.

The number of quarries is estimated at 645, of which 387 are worked. Of these, about 329 give Sicilian, 27 statuary, 22 veined, 7 dove, and 2 peacock marble. The quarries give work to 4,500 quarrymen, whose wages range from 8f. to 2f. a day. Another 1,000 men work in the towns at the sawmills, studios, etc., as sawyers, carvers, rubbers, and polishers.

The conditions of labor in the marble district have undergone little change. Wages are much the same as they were twenty years ago, but the purchasing power has decreased, owing to the heavy taxation and enhanced cost of living. Remedial measures to remove or mitigate the grievances that gave rise to the riots in 1894 were proposed before they were quelled, but there has not been time to carry them all into effect. One of them, a fund to provide against accidents and their consequences, has been raised by the addition of a small percentage to the tax levied on the output, known as "pedaggio." The sum thus raised during 1895 was £1,950, and five houses were built at the quarries to render first aid.

Accidents and injuries are of daily occurrence. The serious ones are between 70 and 80 yearly, and those terminating fatally are about 8 per annum. The quarryman's life is not a pleasant one. He leaves his home often in the small hours of the night, so as to be at his work soon after daylight. A huge slice of bread crammed into his pocket is breakfast and dinner; his supper will be a dish of coarse "minestra," and perhaps a glass of sour wine; meat he never tastes, unless a little on Sunday; nevertheless, says the vice consul, he is a good fellow, rather rough spoken and indifferent to his religious observances, but thoroughly honest.

Little machinery is used except at the sawmills, and this is made in Italy. A good supply of iron for the saw blades comes from Germany, and is rolled out at Udine, in Italy. It is of better quality and cheaper than English. A few tools also come from Germany, but besides these saw blades and tools, other articles, such as machine belts, steel and hardware goods, which at one time were obtained exclusively in England, are now either manufactured in Italy or obtained in Germany. However, there is one article which is always imported from France, viz., "lifting jacks," as those made in Germany or England are not adapted to the requirements of the Carrara quarries.

A NEW source of vanadium compounds has been found on the South American Andes. On one of the high plateaus a mine of anthracite has been located, which, when burned, leaves an ash containing vanadium and silver. The vanadium is now being extracted for use in making aniline black and coloring porcelain.

THE NEW HIPPOPOTAMUS OF THE GARDEN OF PLANTS, OF PARIS.

The most important of the acquisitions recently made by the Garden of Plants, of Paris, is that of a young male hippopotamus, a native of Senegal, which has just taken its place alongside of a female specimen that was presented to the menagerie in 1855 by Halim Pasha, brother of the Viceroy of Egypt. This female, during the course of her forty-one years of captivity, to which she was reduced at the tender age of one year and a half, mated with a male that entered the menagerie at the same date, and that she had the misfortune to lose in 1881, after a long union that was sometimes disturbed by his bad temper. She, on the contrary, has always shown herself very gentle. As good a

OPEN JAW OF HIPPOPOTAMUS.

mother as she was a patient spouse, she exhibited a touching tenderness toward the four young ones that she brought successively into the world. Unfortunately she had not the satisfaction of rearing these; but her family affliction does not seem to have led to a loss of appetite. At present, aside from the rolls thrown to her by visitors, the following is her daily bill of fare: Principal meal, one bundle of lucerne, one of hay, and a few pecks of beets, carrots and potatoes; supper, forty gallons of a mash of fine grits.

We noted these details this very week at the museum, whither we went to "interview" young Keko (for such is the name of the new comer). Not having been able to obtain the favor of being immediately presented to him, we in the first place paid a visit to the venerable widow, whom we have somewhat neglected in recent years. We had the pleasure of ascertaining that she was very well, and that she had not improved in beauty, but had used all her coquetry in preserving the dominant characteristic of her race—ugliness—in which, to use the expression of the naturalist Vogt, the hippopotamus rivals the rhinoceros. A heavy, almost shapeless, mass, measuring 14 to 15 feet in length, and weighing more than 4,500 pounds; an obese belly distended like a leathern bottle upon short bandy legs; a huge head terminating in a thick muzzle and a monstrous mouth; a naked skin of a dirty coppery color; and there you have the beast. Our engravings give a faithful portrait of her, and one of them shows her open jaws armed with formidable teeth. And this is what will become of young Keko in his turn, provided his life is spared. We were finally enabled to see him, and found him charming (in so far as the hippopotamus is concerned), very lively, a little vicious, and full of promise. He is eight months old and already weighs over 400 pounds. He has up to the present been fed upon milk at the rate of fifteen gallons a day. His keeper heats his bath to 73° F. for fear he may take cold, since even now he has those aquatic habits that justify the name of his genus. It is less through the rareness of the species (which is essentially of African origin) that is explained the limited number of hippopotamuses in menageries than through the difficulty of transporting these cumbersome amphibians. Hence the particular solicitude of the museum administration for the subjects that it has the good fortune to own.—L'Illustration.

THE NEW HIPPOPOTAMUS OF THE GARDEN OF PLANTS, OF PARIS.

Excavations at Jerusalem.

At the general meeting of the Palestine Exploration Fund this year, says the London Standard, Lieut.-Col. Watson read the annual report, which stated that the excavations at Jerusalem, for which a firman was granted by the Porte, have been carried on by Dr. Bliss with success. An interesting rockscarp has been traced for some distance along the side of an old wall of the city, south of the present wall, and followed for over 1,000 feet. In this line of wall the remains of several ancient towers and a gateway were discovered, and no less than four sills of this ancient gateway, belonging to four different periods, were found in situ, one above the other. Dr. Bliss wrote, saying that he knew of no more interesting example of a place where four distinct periods might be studied in the short perpendicular space of four feet.

Subsequently, on following the wall toward Siloam, there was found near the bottom of the hill another gateway, also representing four distinct periods. A retaining wall, across the mouth of the Tyropean Valley, was examined. It was still too early to know the full significance of these discoveries.

Dr. Bliss, in a summary of the results of the excavations, stated that near Siloam, outside the city wall, interesting Roman baths were discovered. Their work, he added, had gone very smoothly. A buried wall was no respecter of persons, and ran through the lands of a Greek patriarch, a Moslem pasha, a Latin father or a Siloam fellah, with all of whom the excavators must come to some understanding, financial or otherwise. But he was glad to say that this understanding had always been friendly. Unfortunately, most of their work had been covered up; a barley field had revealed its secrets, and once again was in superficial appearance a mere barley field.

The excavations were not the only work which have been carried on at Jerusalem under the auspices of the fund. The veteran explorer Herr von Schick has pursued investigations of a very interesting character within the city. His examination of mediæval churches and convents in Jerusalem and of the quarter known as Bab Hytta threw a flood of light on the conditions of the Holy City during the period covered by the Crusaders' occupation of it.

The executive committee, in concluding its report, stated that, in order to carry out the objects of the fund effectively, a considerable increase in its income was absolutely and essentially necessary, otherwise the excavations at Jerusalem would have to be suspended. Having so lately obtained the firman from the Sultan for continuing these operations, which had been prosecuted to the present time with such unequaled success, their cessation or delay would be a matter most deeply to be deplored.

Sir Charles Wilson, the chairman, moved the adoption of the report, and said that the most interesting point they wished to solve next was the course of the wall in the Tyropean Valley, and which was the gate through which the last king of Jerusalem fled. He considered that Dr. Bliss had carried out the work in a remarkably successful manner and at a very cheap rate. Future experiments, he was afraid, would be more expensive, but he believed that the results would be worth the money laid out.

© 1896 SCIENTIFIC AMERICAN, INC.

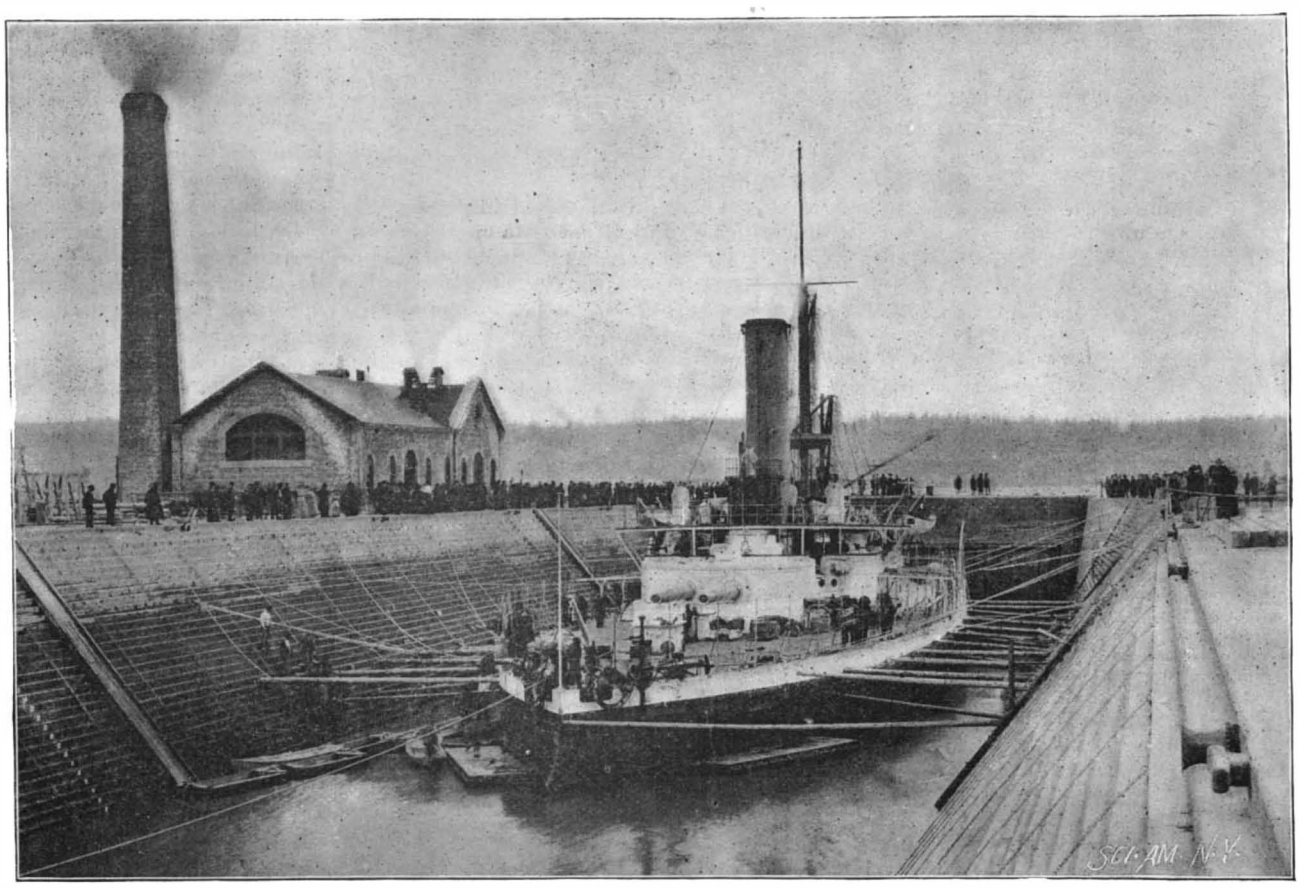
GOVERNMENT DRY DOCK AT PORT ORCHARD, PUGET SOUND, WASHINGTON.

(Continued from first page.)

and the wheels for operating the gates below. A row of four 20 inch pipes runs through the hull about 8 feet above the keel, and eight more are in a tier about 15 feet above the keel. These are used in refilling the dock. Besides the ordinary pig iron ballast there is a chamber, with exterior connections, for water ballast. A 10 inch piece of timber is bolted to the steel keel, and to the face of this timber is copper fastened a strip of rubber 6 inches wide and about 1½ inch thick in the middle and tapering to the edges.

When a vessel is docked, this caisson is hauled into position by means of the steam windlass; its draught is then regulated by means of the water ballasting, and when the pumps begin to lower the water inside the dock, the pressure of the external water forces it to a seat against the granite masonry facing, the rubber strip acting as a packing and making a perfectly watertight joint. When a vessel is ready to come out of dock, the twelve 20 inch gates are opened and water pours into the dock through the pipes. When the water inside the dock has risen to the level of that outside, the small centrifugal on the caisson pumps out a portion of the water ballast until the caisson floats up from the seat. It is then swung clear and leaves the entrance of the dock entirely unobstructed.

The boiler and pumping plant are located on the right hand side of the dock entrance. They are installed in a brick building, with stone trimmings, founded upon pile and concrete grillage. The boiler plant consists of six horizontal, eighty 4 inch tube boilers, 6 feet in diameter by 16 feet in length. The pumping plant consists of three 42 inch centrifugal pumps 14 feet high, each operated independently by a 24 by 28 inch vertical engine of the marine type, and an auxiliary 10 inch centrifugal, having its own independent engine, used for keeping the dock dry when empty. These pumps all stand in a pump well, having its floor about 15 feet below mean high water or 18 feet above the bottom of the dock, making the extreme suction of the pumps about 20 feet. The total capacity of the pumps is sufficient to empty the dock, which holds 13,500,000 gallons at mean high water, in two hours.



THE PUGET SOUND DRY DOCK AND PUMPING PLANT.

Work on the second supplemental contract is being pushed for an early completion. A dredge with a "tulip" bucket is completing the excavation in the approach to the dock. A novel feature of this dredge is the operation of opening and closing the bucket by means of compressed air. A 36 inch cylinder is hung upon and connected with the stems of the leaves, and a steam hose pipe makes a flexible connection to the compressor. This method of opening and closing the bucket avoids entirely the waste of material spilled overboard by the old chain toggle, and the waste of time in hauling up and dumping loads of water when the bucket failed to grapple and fill. It makes the action of the bucket positive, easy, and quick.

As soon as dredging is completed the walls of the slip will be constructed, and it is expected the entire contract will be completed well within the time limit.

The Destruction of Military Balloons.

Foreign experiments show that the only possible enemy of a balloon is the shrapnel shell, says the Army and Navy Journal. Experiments with these shells have been made with balloons at elevations ranging from 200 to 800 meters and at a distance of from 3,000 to 5,000 meters from the firing ground. Out of thirty shrapnel shells the Russian artillerymen put twenty-five balls through a balloon 300 meters high and 3,200 meters from the firing ground. At 5,000 meters from the firing ground the Germans made twenty holes in a balloon 250 meters high out of twenty-six shrapnel shells. But when the air ship was 800 meters in the air and the firing distance 5,000 meters, only two balls struck it out of sixty-five shells and three balls out of eighty shells during the experiments last year in Austria. The conclusion is that, in order to keep the balloon beyond the reach of dangerous projectiles, it must be kept 5,000 meters from the enemy and at an altitude of 800 meters, beyond which observations are uncertain. A battery of eight guns was placed at 5,250 meters from the windlass. Firing was begun, but the balloon constantly changed its position. Men in shelter moved the windlass by means of a cable. This obliged the gunners to alter their pointing constantly. They fired eighty shells at it—all that were allowed for the experiment—and when the balloon was hauled down it was found that there were only three insignificant holes in it, which had little or no effect upon its ascending power. Eighty shrapnel shells represented 10,000 balls and pieces of broken shells. From this it would appear that the captive balloon is much less subject to assault than we might suppose. Like the Irishman's horse, it has only two faults: it is hard to catch, and it is good for nothing when caught. As Hoenig shows, it is not to be compared with bold and well mounted officers.

Religious Origin of Sculpture.

What evidence Greek records yield, though not extensive, is to the point. Curtius, who, referring to actions of the singers and composers of hymns as well as to those of the plastic artists, says that "the service of the temple comprehends the whole variety of these efforts," also says that "the earliest sculptors were persons of a sacerdotal character." On another page he adds, concerning sculpture— ". . . in this domain of artistic activity all things were bound by the decrees of the priests and by close relation with religion. . . They [artists] were regarded as persons in the service of the divine religion."

The extent to which sculpture subserved religious purposes may be judged from the statement of Mahaffy that—

"The greatest sculptors, painters, and architects had lavished labor and design upon the buildings [of the oracle of Delphi]. Though Nero had carried off 500 bronze statues, the traveler estimated the remaining works of art at 3,000, and yet these seem to have been almost all statues."

As showing the course of professional development it may be remarked that though, in archaic Greek sculpture, the modes of representing the various deities were, as in Egypt and India, so completely fixed in respect of attitudes, clothing, and appurtenances that change was sacrilege, the art of the sculptor, thus prevented from growing while his semi-priestly function was under priestly control, simultaneously began to acquire freedom and to lose its sacred character when, in such places as the pediments of temples, figures, other than divine, and subjects other than those of worship, came to be represented. Apparently through transitions of this kind it was that sculpture became secularized. Men engaged in chiseling out statues and reliefs in fulfillment of priestly dictates were regarded simply as a superior class of artisans, and did not receive credit as artists. But when no longer thus entirely controlled they executed works independently, they gained applause by their artistic skill and "became prominent celebrities, whose studios were frequented by kings."—Herbert Spencer, in Appletons' Popular Science Monthly.

The Future of the Sahara.

M. Bonnel de Mezières, member of the Maistre and Attanoux Missions, has, says the Paris correspondent of the London Daily News, expressed his opinion on the future of the Sahara, to the effect that there is no doubt that immense sand ocean will be in time changed into a fruitful territory. He says:

"The Sahara rivers which I have crossed all hide a rich subterranean stratum of water, and form the natural passages to the Soudan, on which, with very little trouble, vegetation can be largely developed. In the south of Temassinin and in the Igharghars there are groves of tamarind, gum trees, etc., of two miles long, scarcely separated by grassy and clover-covered plains. The rivers, which in spring are full of water, are from three to ten miles wide. When the water retreats, the beds of the rivers are changed into rich meadows. The date seeds planted by Flatters at El-Biod have grown without the least care into fine trees, and the same is the fact also of the seeds planted near the cisterns of Tebalbalet, in spite of the inconsiderate manner in which the Tuaregs get in the harvest. Trees are not so rare in the Sahara as is supposed. The Tuaregs often assured our expedition that we should have to march for two or three days without finding water, but very soon we found a little out of the path some filled up or otherwise purposely hidden wells. For the Tuaregs, who serve as guides to caravans, always choose the most difficult and desolate routes, in order to keep the caravans in a state of dependency. Caravans will become more frequent; travelers will succeed each other, but the secret of the Sahara is well kept, and its reputation of barrenness is still preserved. For example, Oscar Lenz crossed the Sahara and reached Timbuctoo without seeing anything but desert land, and yet he mentions that behind a chain of hills which he passed there was a place called by the natives 'The Head of the Waters.' Dr. Borth, who was for months in Tuareg camps, and was the guest and friend of the Sheik El Bakey, was told innumerable facts about the traditions and manners of the land; but its geography was hidden from him. When Lieut. Hourst and Lieut. Bluyet explored the region and an arm of the Niger, they found a lake nearly one hundred miles long. And when the officers of the Timbuctoo extended their excursions, they found that not only one but more than twenty lakes existed, all very large, and stretching far to the north into the very heart of the supposed arid Sahara. If there be no water, and, therefore, no vegetation, where does the charcoal come from which is sold by the Tuaregs? Where do they find nourishment for the numerous camels, horses, sheep, asses and goats they possess?"

A Novel Plan of Building.

A German inventor has built a house of tubes, whose advantages are, he says, a constant temperature and, incidentally, strength, comfort, and beauty. He first put up a frame of water tubing, allowing continuous circulation to a stream of water. Around this frame he put up his house in the ordinary way. The peculiarity is that all floors and ceilings are crossed and recrossed by the water pipes. The water, having passed through horizontal tubes under the floors and ceilings, passes through the vertical tubes until all have been gone through. In the summer, fresh, cool water circulates under pressure through the network of tubes, cools off the walls, and, after having run its course, flows considerably warmer than when it entered. In its course it has absorbed much heat, which it carries away. During the long and severe winter the water entering through the basement is first heated to nearly 100 degrees and then forced through the ceiling. Of course much of the heat is left all over the house, and at the outlet the temperature of the water is about 40 degrees. The speed of the circulation of water can be regulated so as to allow fixing a certain temperature, equal throughout the building.—Stone.

© 1896 SCIENTIFIC AMERICAN, INC.

The Chinese Post Office.*

The Chinese government—so a recent telegraphic message from Peking informs us—has requested Sir Robert Hart, of the Imperial Maritime Customs, to reorganize the postal system of the empire. This decision affords another proof that China is awakening at last to a proper consciousness of its backward state, and allows one to indulge the hope that efforts will soon be made in other directions to bring the country more into line with modern progress. The Chinese post, as it stands, is altogether different from anything to be found in any other country which pretends to civilization. It is in the hands of private individuals. There is a special courier service for the conveyance of imperial edicts and other official dispatches; but this corresponds to the corps of Queen's messengers which we have in Great Britain, and is altogether distinct from the postal system. An exception must be made also in the case of treaty ports, where the different nations have their own post offices, the various consuls being regarded as the postmasters for their several countries. They take charge of and transmit communications intended for foreign countries, and they are responsible (with limited responsibility) for communications addressed to dwellers in the district over which their jurisdiction extends. Foreigners living in the interior or away from the treaty ports must make their own arrangements for transmitting their letters and packages to the nearest consul, who will see that they are forwarded. Save when a friend or neighbor is making a journey to that particular place, the only course at their disposal—assuming that they do not care to employ a special messenger—is to intrust the matter to a native "letter shop."

These letter shops are found in great numbers in every town of the empire, and not even the most insignificant village is without one or more. In Shanghai alone there are something like 200, and the rates of transmission are kept low by reason of the competition. For this same reason the shopkeepers are very obliging, and the service they afford is, under the difficult nature of the circumstances, singularly satisfactory. They cannot afford to risk their reputation by bad work, and it says much for the system, as it is carried out, that those foreigners who are under the necessity of availing themselves of it speak well of it in regard to security, though naturally they do not say much for it in the matter of rapid delivery. The letter shop men do not use stamps, but their particular "chop" or seal is always affixed to the envelope or package—for packages of moderate size and weight are carried; and they will insure the sender against loss. When given in at a "letter shop" the contents of an envelope are displayed before it is sealed and stamped with the "chop" of the shop. Charges for transmission of valuables are made on a percentage of declared value, and, as with letters, these differ according to the distance to be carried. A receipt is given, and the shopkeeper then becomes responsible either for its safe delivery with unbroken seal or for its return to the sender.

Owing, as we have hinted, to the competition that exists in large cities and thickly populated districts, this is necessary if the shopkeeper hopes to retain his customers. In some parts of the empire about two-thirds of the expense of transmission is paid by the sender, the remainder being collected from the receiver; thus the shop is secured against entire loss from transient customers. Another feature much appreciated by native merchants is that of keeping an open account with the shop. Charges are entered against regular customers and settlements are made monthly. In case of loss it is seldom necessary to call in the aid of courts, the force of competition being sufficient to insure reasonable settlement. The employes of the several shops go from house to house seeking customers. In the northern provinces, where horses are plentiful and roads relatively good, the letter carriers commonly use horses or donkeys, which are supplied at stations about ten miles apart. Each messenger carries from seventy to eighty pounds of postal matter, and travels about five miles an hour. When he arrives at a station, a few minutes only are allowed to change horses and he is off again till the end of his route is reached, when the bag is given to a fresh man, who starts at once, now matter what may be the hour of the day or night, and regardless of wind, rain, heat or cold, until he, too, has completed his service and handed the parcel to a third messenger, and thus it reaches its destination. For short distances, and in all the central and southern parts of China, the messenger travels on foot at a rapid pace. This service would be liable to highway robbery, but the robber bands of each district collect blackmail, and for the sums paid them regularly they not only do not molest the messengers themselves, but agree to keep others from doing so.

There are two kinds of stamps known among dealers as Chinese stamps. The first was introduced by Sir Robert Hart (who is to reorganize the whole system), and is used only in the customs service. The other is a local Shanghai stamp used by a company carrying letters about the city of Shanghai and to outposts where there are foreign consuls, chiefly on the Yangtze River and to the ports of Ningpo and Foochow in the south; Chefoo, Tien-Tsin and Peking in the north. These two systems are entirely in the hands of foreigners.

The Chinese government and the Chinese people have for some years been toying with this question of postal reform. Four years ago, for instance, the Taotai Sheng at Chefoo offered prizes for the four best essays on "How to Establish a Chinese Imperial Post Office." There were about fifty competitors, and the prizes were duly delivered. Some of the essayists proposed the enlargement of the courier system; others the use of the offices and employes of the telegraph companies, where they exist, and still others suggested plans closely modeled upon western systems.

One argument for the establishment of a government system was based on the large revenue to be secured that now goes into the hands of the English, French, American, Japanese and German postal agents at the treaty ports. It is well known that large revenue is collected, especially by the Japanese and English offices. One essayist argued that these government offices should be established because during the war with France, in 1884, the commanders of the French fleet were accustomed to receive letters of great importance to them through the foreign offices in China, and the Chinese were unable to intercept them, as they might have done had they then had an imperial government post office.

Another writer thought branch Chinese post offices should be established at San Francisco, New York, London, Singapore, Australia, etc., where many Chinese live, just as those countries have their branch offices in every open port in China. Another proposed rates varying with distance and with the value of letters. He also recommended the use of an imperial stamp which should have the symbol of a circling dragon, corresponding with that of the coins now issued in the Kwangtung Province, and the words "Chung Kwo Yin Cheng Chu"—i. e., Imperial Chinese Post Office—and the value of each stamp expressed in Chinese and Manchu characters. Some of these proposals are unworkable, but all betray a very sensible appreciation of the advantages of a thorough and comprehensive postal system.

*From the St. James's Gazette.

Fate of the Chicago World's Fair Buildings.

The World's Columbian Exposition Salvage Company have completed their task of removing the buildings of the late World's Fair at Chicago, says the Iron Age. It has stretched over a period of two and a half years, during which time an immense amount of labor has been done. A few buildings have been permitted to remain, but they stand only to serve special purposes, and are only faintly suggestive of the architectural glories which once graced Jackson Park. At the north end of the park stands the Art Palace, now the Columbian Museum, with its thousands of unique treasures. Over by the lake shore is the once beautiful German Building in dilapidation; farther south is to be seen the sham Convent of La Rabida. The Goddess of Liberty still occupies her lofty pedestal, with her cap gone and several of her fingers missing. The old whaler Progress still incumbers the lagoon, because nobody wants to buy it. The vessel was offered the other day for $30. Here the reminders of 1893 end. But what has become of all the rest of the structures that once filled the park? There are "bits" of the World's Fair at the present time all over the world—in Europe, in Asia, in Africa, in the two Americas, in Australia.

The story of the principal buildings is soon told. In the main it may be told in one word—ashes. Everybody knows the fate of the cold storage building and later of the Peristyle, Music Hall and Casino. Everybody, too, remembers that grand pyrotechnic display—the great fire of July 3, 1894—when the Manufactures Building, Machinery Hall, the Agricultural Building, the Mines and Mining Building, the Electrical Building, the Administration Building, the Terminal Station, and a number of minor structures were consumed. Those fires left but one article of salvage—the steel. This material for the most part went to two places—the rolling mills of the Illinois Steel Company and the steel furnaces at Pittsburg.

Of the remaining buildings a portion of one was removed to Springfield, Ill., two were taken to Kansas City, one was moved over in Stony Island Avenue, Chicago, and still another was worked over into a flat building. These are the only structures that preserve anything like their integrity. The structural iron of United States Government Building was sold to the Lane Bridge Works. The trusses from the boiler house went to Muncie, Ind. The trusses of the annex to the Transportation Building went to Milwaukee.

The New York Building, one of the most costly of the State edifices, was almost a complete failure as salvage. The fine mural paintings by Millet were on the plaster and had to be sacrificed. The Iowa and Ohio buildings were annexed to other buildings and were scarcely worth tearing down. The Texas Building was another failure from the standpoint of the wreckers. Only part of the Illinois Building, it will be remembered, was left by fire—the rest went up in smoke one Sunday afternoon. The Washington Building, that excited such comment by its massive logs, was torn down and the timbers for the most part sawed up.

J. C. Rogers, of Kansas City, secured the Wisconsin State Building and the Victoria Building. In addition he bought portions of other structures. The Wisconsin Building has been reconstructed at Grand Avenue and Seventh Street, Kansas City, where it has been opened as a "gentlemen's club." The building has been christened "The Wisconsin." He is now reconstructing and fitting up the Victoria Building, in Kansas City, for a private residence. Among the equipments of this house will be the six oil paintings formerly in the dome of the United States Government Building.

Mr. Meyers bought the Pennsylvania Building, had it torn down carefully, and used the material in the erection of a flat building at Emerald Avenue and Forty-third Street.

The Rhode Island Building was secured by Dr. Willoughby and moved to Stony Island Avenue and Seventieth Street.

Of the twenty buildings bought by the wrecking company the seven largest were burned, leaving only the steel as salvage. The other thirteen did not have as much material together as one of those burned. The figures of the company show that the cost of labor in taking down these thirteen and removing the debris of the other seven was $150,000.

Over 500,000 square feet of glass was sold to cornice men and florists. The latter used it in building greenhouses and the former sold it in their trade.

All the gutta percha pipe used at the World's Fair was sold to the United States Commission of Fisheries, at Gloucester, Mass., for $250. The underground pipe on the grounds went to the John Davis Company, Chicago, and was sold to small towns.

The Fisheries Building had little salvage, but it was the one building in demand. Mr. Rogers started the ball rolling when he put in a bid for the glass. Then followed innumerable applications for frogs, lizards, fish, and other ornaments from the columns. These little plaster ornaments were soon at a premium, and a few of them are now being held at a fairly good price.

There are thousands of flag poles all over the West that were in use in some capacity or other at the fair. Schools, convents and universities bought specimens of staff work, some but a few pieces and others large collections.

The fire of July 3, 1894, was especially disastrous to the art interests of the fair. All the figures from the main buildings were taken down, with the expectation that there would be a demand for them, and more money could be made from them than from the regular salvage. Most of the little angels from the Women's Building, the symbolic figures, reliefs, and so forth, were put in the Electrical Building, where it was intended to exhibit them prior to putting them on sale. The fire came and swept them all away. A few memorable souvenirs, however, were saved. President H. N. Higinbotham secured the four lions that kept guard at the base of the obelisk near the south lagoon. They now lord it over inoffensive ducks and chickens at Mr. Higinbotham's farm at Elgin.

The statue of Ben Franklin that stood in front of the Electricity Building, the work of Carl Rohl Smith, was bought by the University of Pennsylvania, and is now in Philadelphia. The statue of Columbus that stood before the Administration Building is now in the Field Columbian Museum. The city of Denver bought the Indian on horseback, and cowboy, the two statues that excited such comment during the time the fair was being held. The park commissioners still own the group that stood about the main basin. One of the groups of the four races is in the museum of Jackson Park, the others were burned. Minerva and Julius Cæsar stand near the museum building. The celebrated Golden Gateway is still intact. It is being held by a local dealer in statuary, and was recently offered to the city of Cleveland for $1,200.

Difference Between India Rubber and Gutta Percha.

"India rubber is of a soft, gummy nature, not very tenacious, astonishingly elastic."

"Gutta percha is fibrous, extremely tenacious, and without much elasticity or flexibility."

"India rubber once reduced to a liquid state by heat, appears like tar and is unfit for further use."

"Gutta percha may be melted and cooled any number of times without injury for future manufacture."

"India rubber coming in contact with oily or fatty substances is soon decomposed and ruined."

"Gutta percha is not decomposed by coming in contact with oily or fatty substances."

"India rubber is ruined by coming in contact with sulphuric, muriatic, and other acids."

"Gutta percha resists the action of these and nearly all acids."

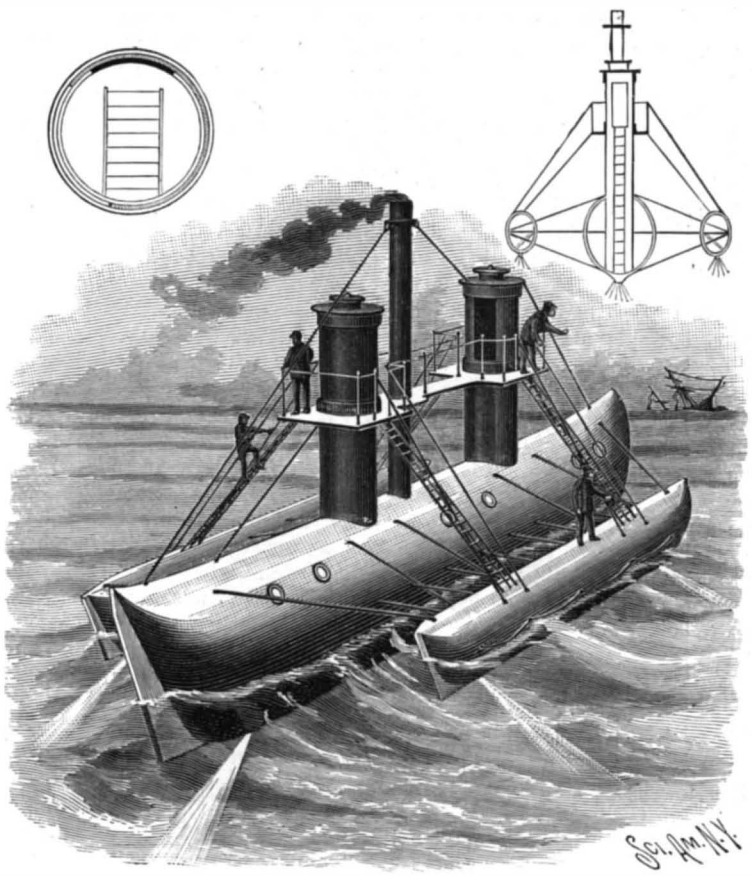
"India rubber is a conductor of heat, cold and electricity."

"Gutta percha is a non-conductor of heat, cold, and electricity."—The Formulary.

© 1896 SCIENTIFIC AMERICAN, INC.

A JET PROPELLED LIFEBOAT.

The illustration represents a lifeboat of strong and simple construction, arranged to be propelled by means of jets discharged either forward or backward, and provided with substantial floats rigidly connected with the hull on each side to hold the boat steady and break the force of the waves. This boat forms the subject of a patent issued to William F. James, of Denton, Texas. One of the small figures is a sectional view of one of the revoluble hatches, of which the boat has two, and the other is a cross section of the boat on the line of its front revoluble hatch. The central hull has bulkheads forming five watertight compartments, of which the middle one is used as an engine and boiler room, while from the two adjacent compartments ladders extend up into outlet towers, closed at their upper ends by revoluble hatches. Each of these hatches opens on a platform supported above the deck, and ladders lead from the platform to the top of the floats. The propulsion of the boat is effected by means of a pump located in the engine compartment, by which water is drawn in centrally at the bottom of the hull, and expelled through pipes at its rear or front end, according as the boat is to be propelled forward or backward. This suction of a powerful pump in the center of the vessel is designed to materially assist in keeping the boat steady in the water. Similar pipes also extend from the pump to the front and rear ends of the floats, the vessel being steered either to the right or left by forcing water through one of the pipes in one of the sets, and the auxiliary pipes in the floats being also used when desired in the propulsion of the vessel forward or backward. Other pipes lead to openings in the sides of the floats, where their discharge is directed downward and outward, to assist to turn the vessel, to keep it from drifting on to a wreck or rocks, and to keep it from capsizing when in the trough of the sea. The pump is also connected by suitable pipes with the various compartments and the interior of the floats, to pump out water, should they become accidentally flooded. As the boat has no rudder or screw propelier, it is designed to stand the roughest weather without being damaged or disabled, and when the boat approaches a wreck the platform and hatches may be readily reached by those who are rescued, the interior of the central hull being then conveniently accessible.



THE WILLIAM F. JAMES LIFEBOAT.

The Inheritance of Acquired Characters.

Prof. Retzius has lately published an account of certain observations on the fœtus of Swedes, which, in connection with similar observations recorded by Surgeon Havelock Charles on the Punjabite, he believes to support the Lamarckian view that acquired characters are inherited. He endeavors to show that the evidence in support of the theory is to be found in our own skeletons. Some years ago, Prof. Arthur Thomson pointed out that in certain races of men who habitually adopt a "squatting position," the tibia and astragalus present additional articular facets, allowing greater flexure of these bones upon one another than is possible (or at any rate normal) in Europeans and other civilized races who have given up squatting, and in which these facets are absent. Accompanying these facets there is a retroversion of the head of the tibia. Both these characters are present in apes and in certain prehistoric races, and Surgeon Havelock Charles described, a year or two back, a series of instances of their presence not only in the adult Punjabite, but in the fœtus. At the meeting of the British Association at Oxford, Prof. A. Macalister exhibited these specimens, as well as similar specimens taken from British infants, and a discussion followed on the meaning of these peculiarities. Now Retzius ("Ueber die Vererbung erworbener Eigenschaften," Biol. Untersuch., N F. vii) records these same characters in fœtal Swedes, from an early age, even up to eight months; and reviewing the facts, he comes to the conclusion—in which I think most of us would agree—that the presence of these characters, viz., the retroversion of the head of the tibia, and "Thomson's facets," is a more primitive condition than their absence in normal Europeans of the present day; that they have been inherited from early times; and in those peoples which habitually adopt the "squatting" position they have become gradually further developed. This last conclusion is perhaps open to question; it is quite possible that even in these races they are less developed than in ancestral forms. But Retzius proceeds to contend that Europeans have undergone gradual change in their skeletons from generation to generation; they no longer sit on their haunches, and have gradually lost the power to do so, and as a consequence "Thomson's facets" have disappeared; and he concludes that "it is, therefore, we Europeans who, on account of changed habits, have undergone changes, and it is in us that these changes have gradually been inherited."

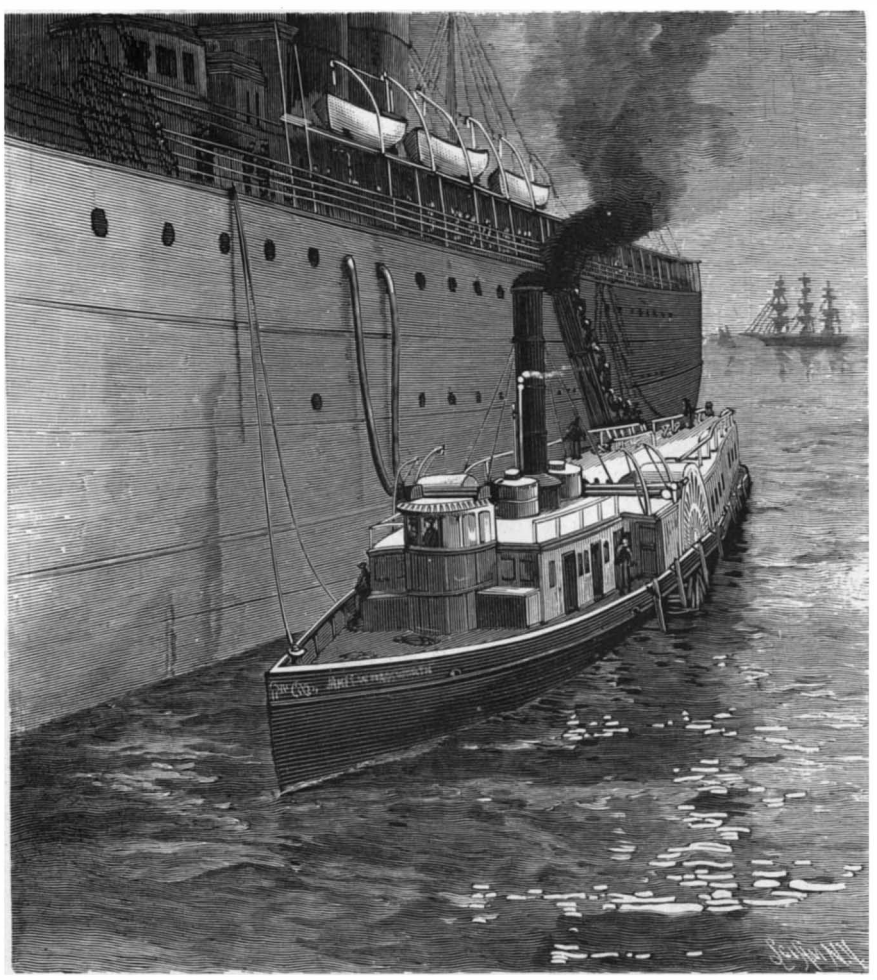
But here it seems to me that Darwinians would join issue with Retzius. His own and other observations show that the changes are not inherited; for the characters of the bones are inherited from the ancestral apelike forms, and it is, surely, only on account of individual habit that the peculiarities are not present in the adult. It is by no means clear what is the "acquired" character on which Retzius hangs his views. Is it the osteological peculiarity, or the habit of using chairs to sit upon, instead of employing the squatting posture? His own researches show that the osteological characters are not acquired, while the habit of walking upright and sitting on chairs is distinctly acquired, and it is in relation to this acquirement that the osteological peculiarities cease to be evident. Young children, as we know, can and do sit upon their haunches, and can move their legs and ankles in a way that an adult, unless he is fairly athletic, finds it impossible to do; and it appears probable that the disappearance of the facets in the adult is closely connected with the ossification of the bone, which will obliterate the facets now no longer brought into use. It would be interesting to examine in this connection the leg bones of "contortionists" and others who make a free use of their legs and ankles, for a very little practice enables even civilized men to employ exaggerated movements of their limbs. Another point to which attention might be directed (which indeed may have been looked into) is the character of the articulation of the bones of the great toe in those races which make use of this digit. A casual observation on the skeleton of an Andaman shows that the articular surface of the first metatarsal with the entocuneiform is distinctly more rounded than in a European—a feature in which there is an approach to the condition in the apes. It might have been presumed that some difference, similar to that in Europeans and Punjabites, would be found in digitigrade and plantigrade mammals; but the result of a brief examination of skeletons of such forms is sufficiently surprising to be referred to; for instance, in the lion there is a facet of the same kind as, but not really homologous with, Thomson's facet, at the lower end of the tibia. This is absent in the bear and the dog: it is also absent in the sea otter. It is present, however, in the beaver and other rodents; it exists in some ruminants, as well as in the horse, but is only slightly developed in the tapir, and is absent in the Suidæ.—Nature.

THE DISINFECTING BOAT OF THE NEW YORK STATE BOARD OF HEALTH.

BY T. O'CONOR SLOANE, PH.D.

The most important work of the New York State Board of Health is, perhaps, that done in the port of New York under the administration of Dr. A. H. Doty, health officer of the port. The department under his superintendence has charge of all ships arriving at the port of New York, inspecting them and their passengers, to determine the state of their bills of health, quarantining passengers from an infected port, if necessary, and in general conserving the safety, not merely of the city and State, but to a great extent of the entire country. The admission of infected matter, whether the source of infection be passengers, clothing or cargo, might spread disease far and wide through the land.

On the shores of Staten Island, near Fort Wadsworth, is the health station of the port. It includes, besides the official residences, an office building recently completed, with laboratory and full disinfecting appliances, a dock and fleet of vessels, the most novel and characteristic of which we describe in the present issue.



THE NEW YORK STATE HEALTH BOARD'S DISINFECTING STEAMER JAMES W. WADSWORTH.

This boat, the James W. Wadsworth, represents a complete disinfecting plant, adapted to the treatment of suspected persons, of clothing, bedding, luggage of all descriptions, and of holds of ships. She was arranged to produce a perfect disinfecting boat, the work being done under the superintendence of Mr. E. M. Skinner, of the Department of Health.

Near the stern of the boat and placed amidships is the sterilizing oven. This is a double sided boiler-like structure which is open at its fore and aft ends and which is traversed by an iron cage running on wheels. Its ends are closed, when it is in operation, by doors fastened with lag screws making a hermetical joint. The oven is connected to the steam boiler, so that it can be heated by steam between the walls of the oven, giving dry heat, and if desired, steam can be blown directly into the oven, so as to give wet heat. The oven is used for disinfecting clothing, bedding and baggage of all descriptions. Fore and aft of it are hatchways leading to the upper deck. The material to be treated may be lowered through the after hatch directly into the cage, which is then rolled into the oven. The oven is closed, steam is turned on, and the articles are disinfected and passed out by the forward hatch, the cage being withdrawn through the forward end of the oven. The cage traversing fore and aft comes directly under one or the other hatch as desired. On either side of the oven are separate rooms fitted

© 1896 SCIENTIFIC AMERICAN, INC.

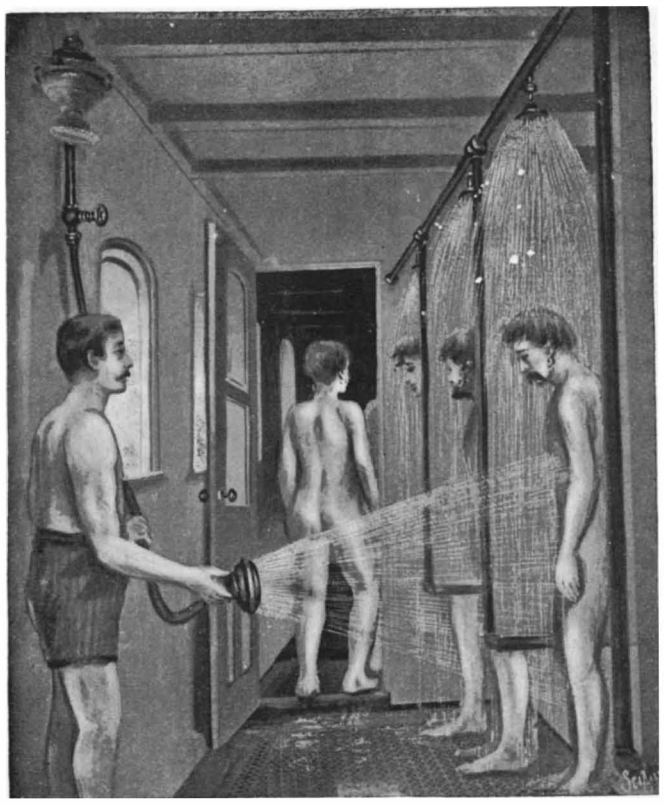
with stalls for bathing, each set of bath rooms having a disrobing apartment immediately aft and a dressing room immediately forward.

The passengers to be disinfected are received from the ship upon the upper deck of the Wadsworth. Descending to the main deck, the women pass to the right and the men to the left to the disrobing rooms. Removing their clothes, these are passed by them and the attendants to the sterilizing oven amidships, where the articles are thrown into the cage, rolled into the oven and treated at a temperature high enough to destroy all germs. The immigrants meanwhile go into the bath rooms and are sprayed, in extreme cases a disinfecting solution being used. After the treatment in the bath they go forward and enter the dressing room, into which their clothes are passed after treatment in the sterilizing oven. It will be seen that the feature of this portion of the boat is having the baths and sterilizing oven all parallel with each other, so that, as the passengers are disinfected in the bath rooms, their clothes are being treated in the oven immediately by their sides. After dressing, the passengers go further forward and are ready for admission to the country.

For the disinfecting of ships a sulphur furnace is provided. This is forward in the boat, and holds eight pailfuls of sulphur divided among four pans in which it is burnt, producing sulphurous acid gas. A fan blower exhausts the gas from the furnace and delivers it through distributing pipes lying athwart the upper deck. To these pipes hose can be attached either on the starboard or port sides for the purpose of disinfecting ships. A very few minutes' operation of the powerful apparatus suffices to fill every nook and cranny of the ship with sulphurous acid gas. Near the upper deck is maintained a large tank for solution of bichloride of mercury. In this a solution of bichloride of any desired strength is kept, and a complete system of piping, with force pump, is supplied for its distribution. It can be used in the bath room for sprays, and lines of hose can be taken into ships for washing down the wood work and other portions wherever disease germs may be suspected.

Lead lining of the bulkheads and floors is used wherever it is thought advisable, and the lines on which the work is carried out are such that any one passing from the stern to the bow of the boat must go through the disinfecting department. Dr. A. H. Doty, in carrying out his ideas on this boat, has produced a wonderfully efficient apparatus, and one which may be accepted as a model for future work.

The principal iron work, such as the disinfecting tank and sulphur furnace, were executed by the firm of Volk & Murdoch, of Charleston, N. C. Our thanks are specially due to Capt. Edward Crawford, chief disinfecter of the department, for information and courtesies received.



THE BATH ROOM.

How to Win Foreign Markets.

One of the greatest competitors of the United States for the foreign trade of the world is Germany. The manufacturers here are "carrying the war into Africa" by endeavoring to establish a large market for their goods in Germany itself. In response to letters sent over to Consul Wamer, at Cologne, inquiring as to the best suggestions for introducing American manufactures and products in the German market, he writes:

"I have repeatedly, in my reports to the Department of State, called special attention to what I consider to be the best method of extending American trade abroad, and that is the sending out of proper representatives, men who are thoroughly acquainted with the class of goods they wish to introduce, and who, further, have a knowledge of the language of the country they may visit. This is the way in which Germany has, to a great extent, built up and extended her foreign trade. I am sure that, if the American merchants would try this plan, they would soon be convinced of the great advantage it has over the present one of scattering advertising circulars broadcast through Europe.

"What the merchants here wish to see are the goods and some one who can satisfactorily explain to them their character and quality. I will give here an illustration of what happened in this respect in recent years with a firm who wished to introduce in Germany a very useful and practical patented machine. After having tried in vain to do so by sending out advertisements, an agent was sent over who thoroughly understood the construction and working of this machine. This agent has now been in Germany for about two years, and he informed me the other day that he had a business during the past year of about $200,000 with this one machine alone.

"I think that if the various trade journals that are taking the greatest interest in ascertaining through the consuls the new enterprises, etc., requiring American manufactures, would work with a view of interesting American manufacturers and exporters in this method of doing business abroad, they would achieve vastly better results than by their present mode of procedure. This should be observed especially in the case of patented articles, where, in many instances, there is no person directly interested and on the spot to prevent any infringement of the patent. Not infrequently I have heard of excellent American inventions copied or slightly altered and put on the market by Germans and sold at a much cheaper price and under their original name, thereby injuring American trade.

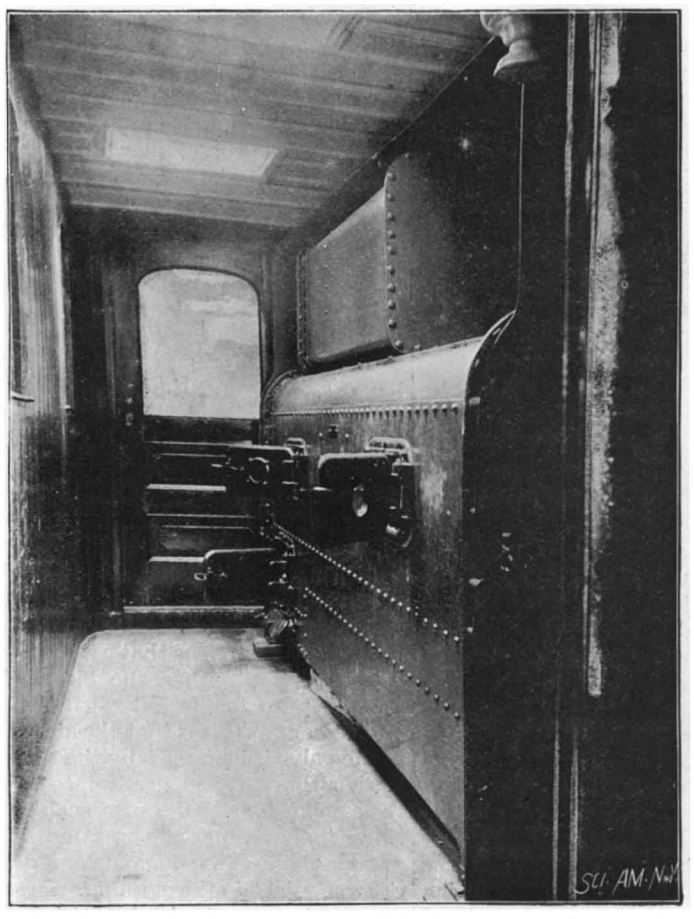
"Perhaps it would not be an unwise plan for leading American firms to unite in sending abroad competent persons to study the requirements and tastes of foreigners and to report the information for the benefit of the firms concerned. This is especially recommended where technical knowledge is required to explain the working and construction of machinery.

"Complaint has also been made that American merchants confine their trade too much to agents at seaport places in Europe, instead of putting themselves more in connection with the merchants in the interior.

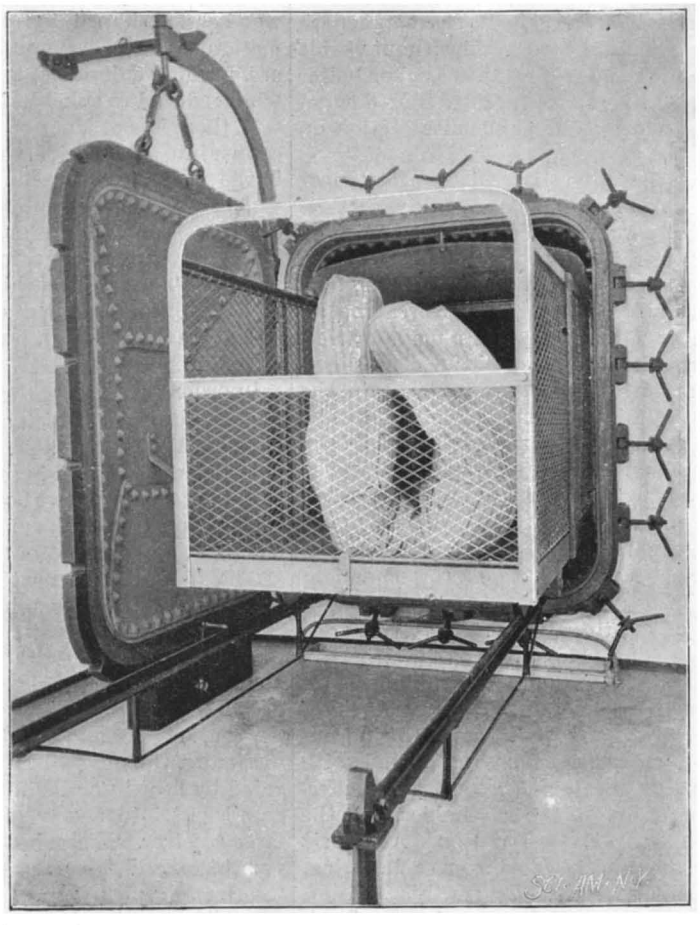
"I would further suggest the practicability of establishing a central bureau in the United States, supported by the contributions of exporting merchants. This bureau would send out capable men to study and ascertain the requirements of foreign countries and the best means of supplying them, and report such information to the central bureau for the benefit of its members."

Consul Tingle, of Brunswick, in response to similar letters, suggests the following:

"An association of American firms, say forty in number, might agree to contribute $50 a month per member for a year to a common fund, which would thus amount to $2,000 per month, or $24,000 annually. A competent manager should then be selected and an import headquarters established in Hamburg. The manager should employ a corps of ten German traveling men. The larger towns in Germany should be visited in turn by the entire corps, each member of which would be thoroughly familiarized with four articles. An exhibition room would be hired, samples carefully arranged, and the different merchants of the city in the various lines personally called upon and invited to inspect the articles in which they were especially interested. The merits of the various samples would then be fully set forth and trial orders solicited. All orders, as well as business detail, would be handled and controlled by the Hamburg office. The corps of workers would remain long enough in one town to exhaust its possibilities thoroughly and would then move on to another, until, by the time the year was at an end, the entire empire would have been covered. Should the results warrant it, the arrangement could then be continued another year or individual firms could establish their own agents in Hamburg on the foundations already made."



THE SULPHUR FURNACE.



THE DISINFECTING OVEN.

Candles in China.

It is not generally known, says the Progressive Age, that several large firms at Tientsin occupy themselves wholly with the importation of candles. Very large quantities of these luminants are imported into Shanghai from Holland, but it is not often possible to find their place of manufacture, owing to the fact that large ports such as London and Hamburg are responsible for the shipment and the contracts of delivery. In the year 1894, 1,000,000 pounds of English candles were imported into Shanghai, and the present payment for a packet of from 9 to 10 oz. is 1·85 taels, and for a packet of 12 to 16 oz., 2·40 taels. These are the sizes mostly in favor with the Chinese consumers. Most of the import firms of Shanghai do business in this trade, but it is extremely likely that in the near future Japanese competition will threaten it; in this, as in other trades, busy Japan has commenced operations.

THE juice of a pineapple cuts the membrane from the throat of a diphtheria patient when nothing else will.

© 1896 SCIENTIFIC AMERICAN, INC.

Science Notes.

The degree of LL.D. has been conferred by Harvard University on Prof. Alexander Graham Bell.

In 1894 the Academie des Sciences opened a subscription for the erection of a statue to Lavoisier, who died in 1794. Some $9,500 has been collected, and the execution of the statue has been given to M. Barrias. The Czar of Russia has been a large contributor.

A piece of furniture is now made to keep bicycles in. It is of handsomely carved wood and intended to stand in a hall. It comes in two parts. The lower, which is made a little higher than the wheels, opens with two broad doors, while the upper is much narrower, being intended to accommodate the handles and saddles. A shelf is provided to hold any extras one may have, as hats or gloves.

According to C. E. Benham, although a little of the color of the pearl is caused by striations or fine grooves on the surface of the nacre, the greater part of the color is produced by interference of the rays of light by reflection from the outer and inner surfaces of the thin layers of nacre forming the substance of the pearl. The colors of a pearl have, therefore, a similar origin to those of a soap bubble or the iridescence of ancient glass which has been scaled by time.

According to recent experiments described in the Medical Record, each pint of air breathed in by an adult contains about 15,000 microbes. In some places the number is as high as a million, but the average city number is about as stated. This microbe-laden air is taken into the air passages, and when it is thrown out it is quite sterile. The air has further been found to be sterile in the naso-pharyngeal cavity. The inference is that the nose is a most powerful microbe destroyer, and this fact shows also how important it is to draw the air through the nasal passages.

Mr. Witmer Stone refuses to accept the idea of Gatke that feathers can actually change their color without moulting, unless they are bleached or worn off. He also concludes that the annual moulting is a physiological necessity and is common to all birds; whereas the spring moult and striking changes of plumage effected by abrasion are not physiological necessities, but depend in extent on the height of development and coloration in the adult plumage, and do not necessarily bear any relation to the systematic position of the species.

Experiments made some time back with a new photochronograph have served to correct some of our notions connected with the velocity of projectiles. It appears that in the case of the gun employed, being a $3\frac{5}{8}$ inch field gun, firing a shell weighing 14¼ pounds, with a powder charge of 3¾ pounds, the projectile attained its maximum of velocity at a point situated 6½ feet from the muzzle, the increase of velocity from the muzzle up to this point being 2½ per cent. From this point the velocity gradually decreased, and at 99 feet from the muzzle it had fallen off so far as to be equal to the muzzle velocity.—Revue de l'Armée Belge.

Potassium platino-cyanide is still preferred by Jackson, the English physicist, as the fluorescent substance in experiments with Roentgen rays. He gets twice as much light as from calcium tungstate, and is able, with moderate electric energy, to see distinctly the bones in the thickest part of the body, the jawbones in action, and the outline of the skull. He uses two-thirds of an ounce of the potassium salt in a mucilaginous vehicle over a six inch disk of black cardboard, and affirms that Edison tried too little. Zickler, a German experimenter, has made radiographs with and without visible fluorescence, and finds the latter results equal or better than the former, with the same exposure, thus demonstrating that the rays have a direct chemical action on the plates.

The observers at the Blue Hill Observatory, near Boston, have sent word to William A. Eddy, of Bayonne, that a three pound meteorograph, made by Richaud, of Paris, was raised by them by means of two and one-eighth miles of piano wire, on July 20, to a height of 5,961 feet above the hill, thus breaking all kite altitude records. Three Eddy kites, made by Fergusson, passed through and beyond the clouds, and were only visible at intervals between breaks in the clouds. The kites and instruments remained at the highest point half an hour and exerted a pull of from 110 to 120 pounds. The recording instruments showed that the air was very dry above the clouds and about 18° colder than at the earth's surface. The ascension was managed by Messrs. Rotch, Clayton, and Fergusson.

The farmers of North Holland, says a correspondent of the Gas World, have come into possession of a very interesting source of lighting. About forty years ago borings for water in the polders round the Haarlem Lake, at farms below the level of the surrounding sea, brought up inflammable gas; but, as this gave no light, it was neglected. Now, however, this gas is being systematically bored for, and it comes up mixed with sweet water, making this water effervesce. The effervescing water is brought under a gas holder, and the gas is liberated while the water flows on. About six cubic feet per hour are thus collected from each boring, and the singular result is that many outlying farms, away on the polders of North Holland, below sea level, **are brightly lit up at night by incandescent burners.**

Silver Mining—Method of Mining and Reducing.

BY WILLIAM P. KIBBIE.

Silver, like gold, has been known from the earliest times. The silver mines of Mexico were, until only a few years ago, the richest in the world. Their estimated yearly production is 1,500,000 pounds pure metal. The recent discoveries made in the western regions of the United States, however, appear to have increased the silver yield in this country to such an extent that our mines now produce two-thirds of the entire silver in the world. Chile and Peru come next, while in European countries, Spain is the most productive, the richest mines being those of Hiendelaeneina, in the province of Guadalaxara, which were first opened in 1846.

These mines have yielded millions of wealth, but their product since 1859 has very materially declined. Next in order are the Saxony, Austria, and Harz districts in North Germany. The silver mines in Norway are also valuable.

Great Britain has no silver mines, properly speaking, but since the introduction of a process for the desilverizing of lead smelted from argentiferous galena, a large quantity is annually produced in this way.

The forms in which silver is found are many, but only a few need be mentioned. Very frequently it is found native, in crystallized amorphous masses, which generally are of considerable size. One piece found at Kongsberg, Norway, weighed 500 pounds.

The quantity of silver found in the metallic state, however, is comparatively small. Its principal ores are sulphides or sulphurets—silver glance, or sulphuret of silver, containing, when pure, 87 parts silver and 13 of sulphur; brittle silver ore, or sulphuret of silver and antimony, having 68·5 silver and 14·7 antimony, 16·4 sulphur, and carmine silver ore. The greater part of the produce obtained in Mexico is gotten from these ores. Besides these a great deal of silver is found mixed with other metals such as copper and gold.

THE REDUCTION OF SILVER.

The process that is simplest in ordinary smelting is applied only to the richest ores. These are crushed and mixed with slag, lead and a fraction of iron ore and lime. The whole is then heated in a furnace with charcoal, which brings down the silver and lead at the same time as an alloy. The silver is afterward separated by cupellation.

Many of the richer ores, however, are not pure enough to be treated with advantage by roasting them with lead, etc.; and another plan, known as the amalgamation process, is now in common use. In amalgamation, the vein stuff is ground to a powder. A little sulphuret of iron and about 10 per cent of common salt is added, and the mixture heated in a furnace to a temperature sufficient to expel water, and in part arsenic and zinc. After about two hours the sulphur of the sulphurets takes fire, and is burned off as sulphurous acid, or converted into sulphuric acid, so that the metals become oxides and sulphates. The temperature of the furnace is next raised, when the chlorine of the common salt forms volatile chlorides with zinc, iron, and antimony, and a fixed chloride with silver. The contents of the furnace are continually stirred during the roasting, so that in a given time they form a coarse powder.

After being ground to a fine powder the product is mixed with water and iron in proportion of 10 cwt. and 1 cwt. respectively, the mixture being effected in wood casks shaped like a barrel. During the amalgamation the iron decomposes the chlorides in the roasted ore, forming chloride of iron, while the copper is somewhat reduced to subchloride and metallic copper.

If there is not enough iron present to convert the copper into subchloride, then the mercury will be wasted in the next stage by conversion into its subchloride. Quicksilver to the amount of 5 cwt. is next run into each of the casks, which are set in motion and continue for about 22 hours at the rate of about 13 revolutions per minute. The result of this is that the silver, being precipitated by the presence of metallic copper, is then dissolved by the mercury, but the amalgam so formed is a complex one.

In order to separate the amalgam from the earthy matter, the casks, which are only about two-thirds full, are now filled with water, the dilution casting aside all chloride of silver held in solution by the salt, and kept revolving for about two hours; after which, by means of a stop cock, the amalgam is to flow into the amalgam chamber, and the rest of the contents into the washer.

The quicksilver is next separated from the amalgam by means of bags through which the mercury flows by its own weight and is afterward squeezed through on a flat surface. The result of this operation is that the amalgam of mercury, silver, etc., is left in the bags, its actual composition being mercury 83 per cent, silver 10 per cent, copper and lead 5 per cent.

Finally, the quicksilver of the amalgam itself is separated by heat in a distilling furnace. Here the amalgam is put into a row of iron pots, which go into a large receiver. When heat is applied, the quicksilver volatilizes, and is condensed in a pipe attached to the retort, from which it is collected in launders. The impure silver left in the retort is **refined by fusion and subsequent cupellation.**

Cycle Notes.

A strong solution of washing soda (sodium carbonate) in hot water will be found to be excellent as a cleansing agent for dirty lamps.

It has been generally supposed that a bicyclist was comparatively safe in a thunderstorm, owing to the insulation from the ground afforded by the pneumatic tires. The recent death of a Chicago cyclist from lightning, while riding on the wheel, would seem to prove that this immunity does not exist. The tires, the machine, and the clothing of the cyclist are very liable to become soaked with rain, affording an excellent conductor for the electrical bolt.

Bicycling is to be made easy by a new "house-to-house cycle cleaning and insurance company," just floated in London with a capital of $1,500,000. It will establish depots for the cleaning, storing, repairing, and sale of cycles, and for an annual payment of $6.50 by subscribers will send people to their houses to clean their machines, will insure them for $500 against death and $250 against serious personal injuries while cycling, will store their machines when not in use, and teach them to ride.

According to English statistics, the yearly loss attributed to the bicycle craze is as follows in various trades and professions: Manufacturers of articles for riding and driving, £9,000,000 sterling; dealers in horses and forage, £4,000,000; carriage makers, £3,000,000; harness makers, £2,000,000; piano manufacturers, £3,000,000; watch makers and jewelers, £2,500,000; tobacconists, £1,500,000; horse cars and omnibuses, £600,000; owners of restaurants, £500,000; and physicians, £400,000.—Technische Zeitung's Correspondenz.

Covers to fit over wheels may be made of handsome cretonne or plain materials, outlined with some appropriate design. The seams should be bound with bright colored braids. These covers are very attractive and will serve the double purpose of protecting the bicycle and one's clothing, where the machine has to be kept in small rooms or halls in summer cottages. A cover made of rubber or waterproof cloth would be of advantage at the seashore or where the bicycles are kept in wire-inclosed piazzas. A rubber cover is also now made to fasten over lamps to keep off the dust.

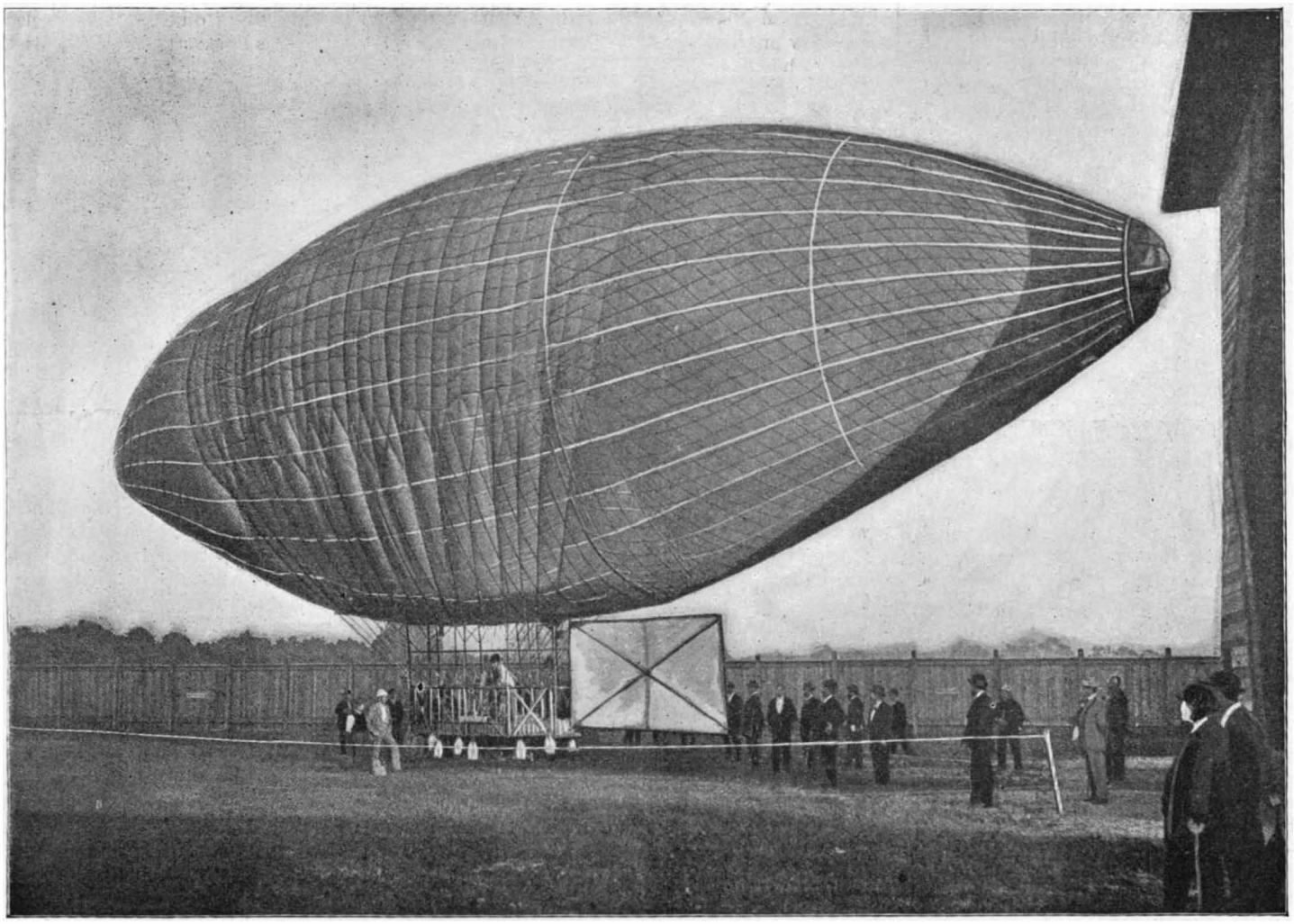
The valve of a bicycle tire is sometimes the cause of grave trouble, and one may suspect that he has been the victim of a slight puncture, when all the trouble is in the valve. No matter how the valve is constructed, an essential part of every one is a rubber washer. As everybody knows, rubber will, in the course of a few months, lose its quality and become "dead," and when this happens it is not strange that the valve fails to hold air. Some valves are so constructed that a rider with the least degree of mechanical skill can remove the plunger in case of necessity and apply a new washer, thus making the valve airtight again; and, so far as riders are concerned, such a valve would seem to have points of superiority over any other. A widely used valve, however, is so made that the plunger and washer can only beg ot at from the inside, that is, by the removal of the entire stem, a job which no one but a regular repairer would undertake. The repair men, as a rule, speak highly of this valve; how far their opinion is formed by the fact that cyclists must come to them in case repairs are necessary, is a matter for conjecture. Happily, the valve in question does not get out of order readily. Many valves are constructed with a coil spring to hold the plunger in place; others accomplish the same end through the elastic power of the rubber forming the plunger. The pressure of the air when the pump is applied compresses the spring or stretches the rubber, allowing the air to pass into the tire, and the air pressure immediately restores the plunger to its position, with the washer held tightly in place. Riders have been known, when something appeared to be wrong with a valve, to put a drop of oil in it, forgetting that the effect of oil on rubber is anything but good, and that a valve is never in need of oil to make it work properly. The cap of a valve is commonly an essential part of it, although it ought not to be. At the same time, it will often happen that a valve which, when tested with the cap off, will show a slight leakage of air, will be found airtight with the cap firmly screwed in place. In fact, the caps of some valves are provided with a rubber lining at the inner end, so as to make as tight a joint as possible. In any event, it is unwise to use a tire when the cap of the valve has been lost, since dust and dirt are sure to enter and be the cause of trouble. Apropos of what is said about valves that leak and cause trouble, it not infrequently happens that a valve which allows the air to escape slowly when the bicycle is not in use will serve its purpose all right when the machine is ridden. The reason for this is that the air pressure on the inside of the valve is increased by the rider's weight and the washer thus pressed firmly into its place, shutting off the escape of air. Of course, such a valve is not a good thing to have, but at the same time a rider may feel reasonably safe in going out for a day's run, even if his tire was "flat" in the morning. In such a case, though, it would be a great mistake not to carry a pump.—New York Tribune.

© 1896 SCIENTIFIC AMERICAN, INC.

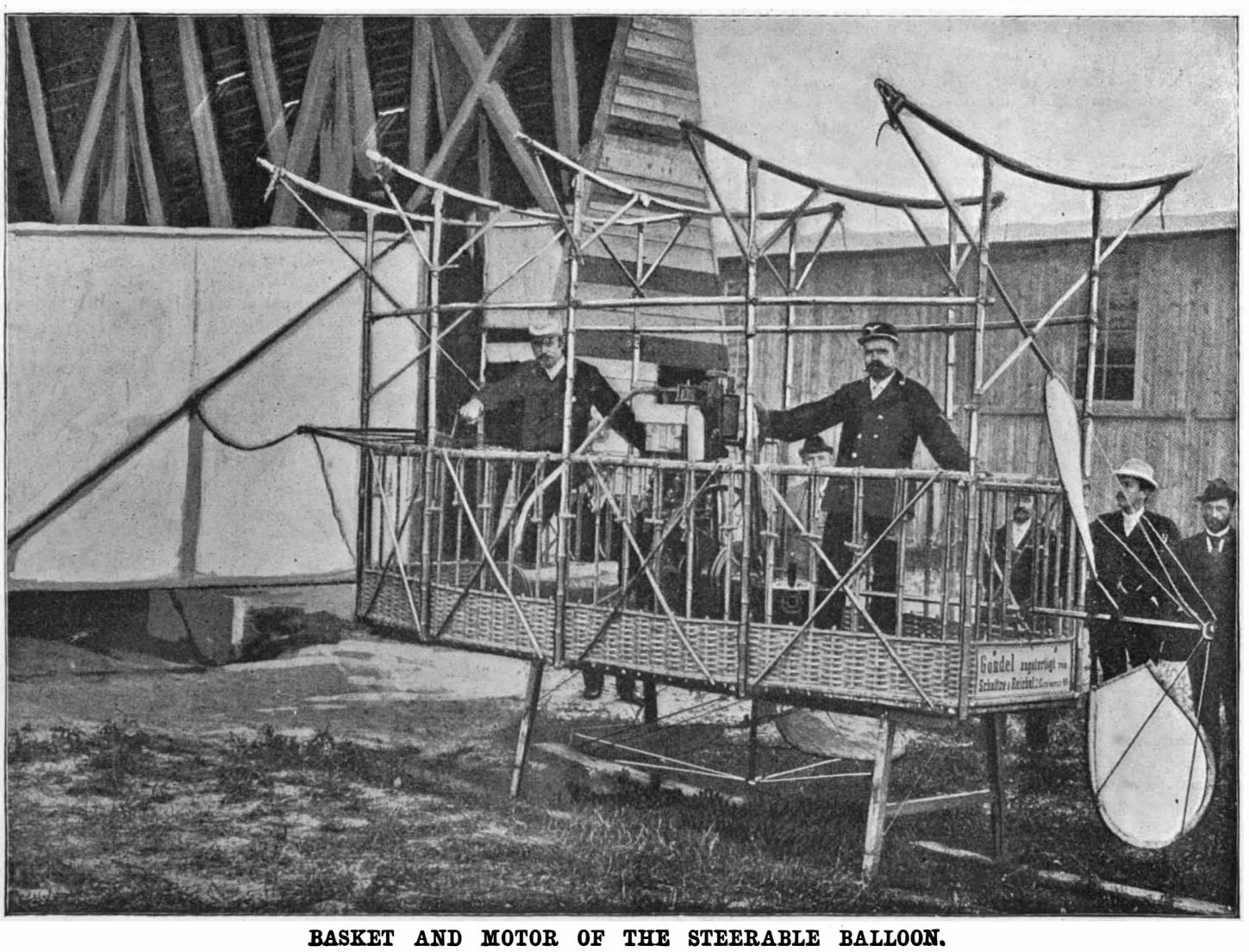
A NEW DIRIGIBLE BALLOON.

At the Berlin Industrial Exhibition there is to be seen a wonderful dirigible balloon. On August 28 and 29 this balloon rose to the height of about sixty-five feet, and was propelled in all directions, even against the wind. The public were allowed to give the directions, so that there should be no doubt as to the genuine powers of the new aerial vessel. Dr. Wolfert, the designer of the balloon, claims that it can be steered against any wind at any altitude, but this has not yet been tested.

The motive power of this elliptically built balloon is an eight horse power engine driving a double bladed ship's propeller, having a diameter of about three yards. It is placed in front of the basket, while below the car is another propeller of the same dimensions, for upward and downward movement. These propellers make 500 revolutions per minute. The monster balloon is over thirty yards long, and in the center the diameter is about ten yards. The basket, from its shape, is called a "gallerie," and is five yards long. It is constructed of bamboo, and is fastened to the balloon in such a way as to form an integral part of its bulky sustainer. Neither part can have separate movement. The method of fastening the two is the secret of the inventor, Dr. Wolfert, who will make no statement about it. He had made fifty-three ascents with other smaller balloons of his construction. On May 20 he made an ascent from the Royal Department of Military Aeronauts' drill ground. This latest and largest of his progeny he has christened "Deutschland," and it is hinted that the form of the balloon is not dissimilar from that ordered by the Spanish government for use against the Cuban revolutionists. We are indebted to the St. James Budget for the photographs and copy.



THE BERLIN INDUSTRIAL EXHIBITION—THE STEERABLE BALLOON.



BASKET AND MOTOR OF THE STEERABLE BALLOON.

The Posture of Repose.

Europeans who take their rest either sitting or lying down are apt to suppose that is the most natural, if not universal, posture of repose. Dr. Regnault, however, declares that in this belief we are wrong, says the English Mechanic. Many races rest with their legs crossed like our tailors; some kneel, others crouch. It is important, we are told, to understand these different attitudes, and see under what influences they vary. The primitive savages crouch down, while their women kneel, this crouching and kneeling posture being so natural to them that they can sleep thus easily. A certain knowledge of outside civilization brings on attitudes with legs crossed, and higher civilization brings in the chair; but at first the sitter will not place himself squarely with both legs hanging, but raises one and puts it on the seat. The children of the black races usually kneel like their mothers, but rarely crouch. The fetish worshiping negro, who is far from contact with white men, crouches, though in a different way. On some of the sources of the Nile they make use of supports from 7 to 11 inches high out of pieces of wood. Sometimes it is a round stick supported by a central foot, at other times a square whose sides are raised at right and left, and upborne by four cylindrical legs. The white races of Europe and America sit when they rest; they know that crouching causes fatigue, and they only resort to it when they desire to pick up something. If the white man can find no seat, he sits on the ground with his legs outstretched. The women, however retain the habits of their primitive ancestors, and exhibit great facility in kneeling at work. The Semites, on the contrary, make no use of chairs. Mussulmans cross their legs in what they call the Turkish fashion, but in Turkey and Persia the favorite position is kneeling. Invited guests in Persian saloons who know the correct thing place themselves on their knees against the wall, the tailor's attitude being regarded as very uncivil.

Weighing Ice by Measure.

A correspondent of the Western Druggist complains that he is continually defrauded in the ice delivered for his soda fountain, and weighing not being exactly practicable, he wants to know if he cannot find the true weight of a chunk of ice by measurement.

St. Louis druggists are not alone in their complaint about short weight on ice, and the explanation for the diminutive size of a 100 pound chunk of ice, namely, that it is the coldness of it which has contracted it so, will be as familiar to them as to their brethren in ill luck in Chicago. As to the question of our correspondent, that is entirely apropos, and we take pleasure in assisting him. The calculation is quite simple if we remember that one cubic foot of water weighs 62·5 pounds. One cubic foot equals 12 × 12 × 12, or 1,728 cubic inches. Dividing this by the number of pounds of water gives us 1,728 ÷ 62·5 = 27·65. Hence, one pound of water measures 27·65 cubic inches, which for 100 pounds makes 2,765 cubic inches. While ice blocks, as delivered, are not always of exactly rectangular shape, yet in a majority of cases the weight could be determined approximately correct. We would advise our readers to try this plan, appealing to the scales when their figures are doubted.

© 1896 SCIENTIFIC AMERICAN, INC.

Forge and Bench.

The large brick forge and leather bellows, so often poetized and made the theme for the artist's pencil, is rapidly becoming a thing of the past, and ere long it will be known only as a memory, or through verse and canvas. The little old dingy shop, with its huge forge and dust-begrimed bellows, served well its time and deserves its history, but it, like everything else in these days of progress, must give way to more modern methods. The portable forge and hand or power blower furnish a neater and more perfect forge than the old brick one in its palmiest days, and no modern smith would think of fitting up a new shop with any other. The advantages of these forges are their compactness and simplicity and assured draught. The small blower, whether worked by hand or power, gives a uniform blast, and one that can be regulated at will. The portability of these forges is another feature in their favor, while the room occupied by one is much less than that required for the brick. Its construction invites cleanliness, and as a result there is none of that accumulation of waste of all kinds so common with the brick forge. Every manufacturer of these forges, while claiming special merit for his own, claims for them greatly superior heating power over the brick, and a shorter consumption of coal. Combining, therefore, as these forges do, cheapness, utility, and superiority in all respects, there can be no excuse for fitting up a factory with the brick forges or retaining the old ones.

Another important improvement in the smith shop is the portable tool bench. This is built of iron tubing (gas pipe), with board top and two drawers for storage of small articles, one being fitted up for dies, taps, and other fine tools.

The bench should stand 33 inches high when on the rollers, and be about 31 inches square. The bench is inclosed on three sides to the depth of 20 inches; on the fourth side it is inclosed by a fixed board extending 10 inches below the top, to which is hinged a board of like depth. This lid is provided with hinged legs, the feet of which run on ratchet irons by which the lid is supported, converting it into a shelf. The drawers are placed below the flooring or bottom. The tool racks are of round iron, and arranged to hold all the bench tools, such as swages, tongs, etc. Special tools can be kept on the inside, as the lid can be secured by a lock; this makes a good receptacle for small forgings not completed, or can be kept for patterns as well as for tools. One of the drawers should be kept for slates, paper, chalk, etc.

Such a bench will last a lifetime, cost but little, if any, more than a plain wood bench to construct, can be moved easily and kept clean and in order with but little trouble.—The Hub.

Points in an Employer's Liability to Employes.

A workman does not assume a risk where he knows there is some danger without appreciating it.

An employer is bound to use reasonable care to see that machinery used by his workmen is in proper condition.

The mere fact that a workman received an injury raises no presumption of negligence on the part of his employer.

A workman does not assume the risk of injuries from a latent defect in machinery, because his opportunity of discovery is the same as his employer's.

An employer is bound to give notice of latent dangers, among which the employe is required to work, and of which the employer has knowledge or should have had knowledge.

A person entering the service of another assumes all risks naturally incident to that employment, including the danger of injury by the fault or negligence of a fellow workman.

The mere fact that an employe was careless in doing a certain piece of work does not show that he was a reckless and incompetent workman, whom it was negligence to employ or keep.

Where a workman knows that the appliances with which he works are defective, and he does not complain to his employer, or representative, of their condition, he assumes the risk of their use.

The fact that a superintendent assures a workman that there is no danger, and tells him to return to work, does not relieve the workman of the assumption of the risk, he being of full age and knowing the danger.

The mere fact that a manufacturer hires an unlicensed engineer to run his boiler does not render him liable to other employes for personal injuries caused by the explosion of the boiler.

An employer is not required to use the most improved kinds of machinery in his factory. It is sufficient that the machinery was reasonably safe and suitable for the purpose for which it was used.

An employer is not bound to anticipate every probable risk which may happen in the use of a machine, but discharges his duty if he give such general instructions as will enable the employe to comprehend the danger.

When an employe's duty to inspect and repair machinery is incident to his use of the machinery in a common employment with other workmen, the employer is not liable to fellow workmen for the negligence of such employe.

An employer who calls a surgeon to aid an injured employe is not liable for the negligence or malpractice of the surgeon, provided the latter had knowledge and skill ordinarily possessed by other surgeons, and the employer had no reason to suspect that the surgeon would fail in his duty.

An employe of mature years who was removed from one employment to another, without objection by him, cannot recover from his employer for injuries received through his unfamiliarity with the machinery which he was required to operate, unless his employer knew of his inexperience in that direction, or was informed of it by the employe.

When the conditions of a mill and the relative situations of the deceased and his fellow workmen would suggest to a person of common intelligence menacing and obvious perils from the use and operation of the machinery, an employe who continues to work in it assumes the risk, though it arises from the negligence of the employer, and the latter is not liable for the death of the employe.—The Manufacturer.

Motor Carriages for Postal Service.

Motor carriages of the Daimler type are employed by the post office authorities at Colombo, Ceylon, for carrying mail bags and packages to the post office and to the railway station. A saving of sixty per cent has been effected by using these carriages instead of wagons driven by horses.—Uhland's Wochenschrift.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—Andrus S. Weaver, Newark, N. Y. This coupling has a swinging knuckle, and the invention provides a simple automatic means for throwing the knuckle to an open position on releasing its locking mechanism, the construction of the coupling being strong and serviceable, relieving shock on the coupling head while coupling cars and in starting a heavily loaded train. Spring yielding angle levers have anti-friction roller engagement with curved flanges on laterally extended portions of the head, and the shank of the coupler extends through a hanger which supports a roller on which the shank portion of the coupler may move. The coupler may be readily attached to any car, and a broken part may be readily replaced by a new one.

DUST AND DRAUGHT ARRESTER.—Hayes C. Schoyer, Altoona, Pa. To protect the occupant of a seat in a car from the draught and dust of an open window opposite the seat just in front, this inventor has devised a novel protecting plate and means of clamping it to the back of the seat in the rear of the open window. The plate may be of cardboard or a suitable panel of wood or thin metal, of a size to be carried in a hand satchel if desired, and the clamp is mainly composed of bent and coiled wire, bracing and steadying the plate, and having bowed or arched side arms designed to bind firmly on the upper edge of a car seat. The device is inexpensive, can be conveniently carried and quickly applied.

Electrical.

A SPHERICAL CAR.—Shadrach A. Mustain, Rincon, New Mexico. For transporting mail, express and other matter, at a high speed and low cost, over an elevated railroad track, this invention provides a frame in which turn carrying globes having treads to travel on the track rails. The globes have their axles journaled in the frame, and the frames have coupling devices by which several of them may be connected to form a train, which is preferably driven by a motor from an electric trolley wire, a small motor being supported on the frame to operate a brake mechanism. The globes form wheels for the support of the frame, as well as receptacles for the material transported.

INTERCHANGEABLE SIGN.—Walter J. Scott and Harold W. Shonnard, New York City. This sign is composed of groupings of incandescent lamps arranged to be interchangeable and to be assembled in an automatic or semi-automatic way, by suitable mechanism, to exhibit word signs. The invention covers a novel reservoir wheel to hold the letters or type, and deliver them to and receive them from the visual sign board or display frame, for the public announcement of news or advertisements.

Miscellaneous.

WHEEL FOR BICYCLES.—Alfred P. Le Gros, Louisville, Ky. In this wheel the hub is provided with a pneumatic cushion, the construction being light and simple and well adapted for light road vehicles, as well as for bicycles, this cushion being so arranged that it is not liable to be perforated or worn, as are the ordinary pneumatic tires. The hub is sleeve-like, and a chambered cushion secured to it has an annular hollow enlargement on its periphery, a casing provided with sockets and composed of two annular sections being secured together and arranged on opposite sides of the cushion, while spokes extend from the sockets in the casing to the rim.

BICYCLE WIND SCREEN.—Thomas L. Monaghan, New York City. This is a light and simple device, readily attachable to a bicycle, to shield the rider from the force of a head wind, and so constructed as to divide or cut the wind, thus reducing the resistance. The screen is made with a wire frame, a cross bar of which swings in a clip loosely engaging the steering head, and on the handle bar are bands carrying fingers which engage the ends of braces. When the screen is in position its upper forward end is above the plane of the handle bar, and the rider, by stooping, may readily place his head behind and within the screen, which may be folded together out of the way when not required for use.

WATER HEATER.—Albert E. Simons and Edward Hixon, Chicago, Ill. To heat the feed water of boilers by live or exhaust steam, or both, according to this invention, the water supply pipe is surrounded by a steam pipe or jacket connected with the live steam supply, and a steam pipe connected with the exhaust is passed through the water pipe, the steam in both cases flowing in an opposite direction to the flow of water, whereby the feed water will be gradually heated, being first subjected to steam at a low temperature and finally to high temperature steam. Exhaust steam may be used in both the inner and outer pipes if desired.

PRINTING PRESS IMPRESSION ADJUSTMENT.—Clarence O. Duffy, Owensborough, Ky. Instead of adjusting the impression by separately moving four screw bolts and nuts, as customary heretofore, this improvement provides for making such adjustment by rotating one shaft by a hand wheel. The several bolts are made movable in a socket and in the head of each bolt and in the side of the socket are coincident slots in which is movable a wedge, the wedges being connected in pairs for simultaneous adjustment by means of centrally connected links, nuts and a rotatable shaft cut with a right and a left hand thread. There are springs for retracting the platen, and its adjustment up or down is instantaneously effected, the platen being kept perfectly parallel to the type while being adjusted.

EMBOSSING ROLLER.—Ferdinand H. Redeker and Frank J. Timmerwilke, Cincinnati, O. For the inexpensive ornamenting of picture mouldings and similar articles these inventors have devised an embossing roller having a peripheral rim adapted to receive and support separate embossing characters, and permitting of easily and rapidly changing the characters on the roller to produce any desired lettering or ornamentation without requiring the use of costly dies. The device is applicable on mouldings covered with plastic compositions or directly on the wood, and any desired name of a business house, firm, etc., may thus be readily embossed upon the work.

STEAM DRYING MACHINE.—Henry Cutler, Wilbraham, Mass. A patent on a similar grain drier was formerly granted to the same inventor, and this invention provides an improved machine of strong and simple construction, and very effective in operation, which is not liable to get clogged or out of order, and is arranged to prevent leakage and freezing. A bucket frame revolves within a stationary casing which has an inlet and outlet for the material to be dried, and held stationary within the frame is a bundle of steam pipes. The bucket frame and casing are in an inclined position, and the grain entering at the upper end is taken up by the buckets and discharged at different points to fall downward over the steam pipes, being then again taken up by the buckets and delivered, when thoroughly dried, at discharge openings.

SEPARATOR.—Alphonse F. Gaiennie, La Fourche, La. Two patents have been granted this inventor for improvements in separators employed in connection with vacuum pans and similar apparatus for separating and collecting the vapors and minute particles of liquid, the inventions providing a simple and inexpensive construction designed to be very effective, and being also adapted for separating oil and grease from exhaust steam. The construction is such that the vapors passed through the separator follow a somewhat devious or circuitous path and deposit the liquid carried in suspension upon plates, whence it flows downward to the lower portion of the separator, the plates having inclined surfaces or being connected by depending flanges.

PIPE JOINT.—John A. Nelson, Nebraska City, Neb. This is an improved joint for use on stove pipes, water conductors, etc., facilitating the connecting and disconnecting of the pipe sections by screwing one into the other. Each pipe section is made with an extension beyond and at one side of the seam, a thread formed in the section beginning at the extension and terminating at the seam at the side opposite to that on which the extension is formed. The two sections thus made readily screw into each other to the extent of one revolution, the projecting ends or extensions forming stops.

BOTTLE STOPPER.—John A. Woodworth, Windsor, Canada. This invention is for a stopper with which a bottle may be sealed so that, when once corked, it cannot be opened without destroying the seal for the cork, thus preventing the bottle from being refilled and sold as an original package. The neck of the bottle has at its top a collar or rim, in one side of which the ends of fastening wires are fixed in the casting or manufacture of the bottle, apertures being also formed in the opposite side of the rim, and when the bottle is corked the wires are passed over the cork and secured by twisting in the apertures, the ends being cut off so that the wire cannot be untwisted.

BOTTLE STOPPER.—Eliot E. Ford and Charles Schlundt, Rahway, N. J. This stopper is for bottles containing liquids under pressure, it being so made that liquids may be forced into the bottle through the stopper and retain their original high pressure. The stopper has a metal head portion having openings separated by a bridge, extended downward from which is a stem, and the neck portion of the head is engaged by a rubber valve stopper. The filling pressure forces the rubber valve away from the stem sufficiently to form a passage, and when the bottle is full and removed from the filler the internal pressure forces the valve against the stem, preventing the reduction of gas pressure by leakage.

FOOD COMPOUND.—John H. Kellogg, Battle Creek, Mich. This inventor has devised a new article of manufacture by a special union or admixture of digested cereals and nuts in certain proportions, producing a food that is very superior for making fat and blood. The final product, whose preparation is described in the patent, is composed of completely digested starch, completely emulsified nut oil, and nut meal in the form of thoroughly cooked and finely divided proteids or vegetable casein and albumen. This food also possesses peptogenic properties whereby it aids digestion of other foods.

GAS BURNER.—Albert Wanner, Jr., Hoboken, N. J. This burner is made with a base, and is adapted to removably support a heating burner and its appurtenances, such as a rest for a curling iron, etc., or an illuminating burner with its globe holder and globe. The invention provides an efficient heating burner of strong and ornamental construction which will preclude the possibility of gas igniting at the air inlets, while provision is made for maintaining a full and steady supply of gas to the series of flame orifices with which the burner is provided.

BURGLAR ALARM.—Oscar B. Weaver, Williamsport, Pa. This alarm is adapted to be secured to the inner side of the door above the lock, and be sounded upon the turning of the door knob. The alarm is adapted to be easily connected with or disconnected from the door knob by means of a latch on an arm having a forked lower end engaging the sleeve portion of the knob.

BOOT RACK.—Walter S. Lambert, Geneseo, Ill. To exhibit boots in stores, holding them out of contact, so that the goods will not become rubbed and shopworn, this inventor has devised a rack composed of vertical standards supporting pairs of horizontal bars on which are placed mortised cross bars whose outer ends form arms for the support of a single boot each, the legs of the boots being passed upon the arms, with the soles outward. The construction is strong and inexpensive.

PAPER BOX.—Alexandre F. Girard, Waco, Texas. This is a knockdown box, to be sold in a flattened out position to take up small space and readily set up in box form, when it may be easily and securely locked. The invention affords an improved blank for this purpose, curved or cut-away edges allowing the locks to fit closely against the side portions to avoid unseemly bulges of the corners, while permitting a nice adjustment between the top and bottom of the box.

SUSPENDERS.—James S. Holt and William E. Eldred, Seattle, Washington. These suspenders are adapted to be readily attached to or detached from the trousers, and are designed to allow free movement of the wearer's body from side to side without much strain or pull on the shoulders, each of the suspender ends readily adjusting themselves in rings connected with the shoulder straps at the back and front, while the shoulder straps may be readily disconnected from the trousers without unbuttoning.

DISPLAY DEVICE FOR STORES.—William H. Knautz, Blue Earth City, Minn. To show to the best advantage handkerchiefs, gloves, scarfs, etc., this inventor hangs a skeleton frame by a chain or cord from an overhead support, the frame being counterbalanced by an interposed balance sleeve, which permits of readily moving the frame up or down as desired. On the frame are clips or clamps to hold the articles to be exhibited, where they may be readily inspected by the purchaser, and the whole device is very neat, simple and inexpensive.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

© 1896 SCIENTIFIC AMERICAN, INC.

NEW BOOKS AND PUBLICATIONS.

ONE THOUSAND POINTERS FOR MACHINISTS AND ENGINEERS. By Charles McShane. Chicago: Griffin & Winters. Pages 342. Price $1.50.

This book is by a practical machinist, and relates especially to work on locomotives. It is designed to be an efficient guide and teacher for the apprentice, and a ready reference book for the machinist, as it gives a digest of the points gained by a modern progressive machinist in a great variety of work during many years.

SEWERAGE AND SEWAGE DISPOSAL. By Henry Robinson, C.E. New York: Spon & Chamberlain. Pp. 192. Price $3.50.

The author of this book is a well known English engineer who treats the subject from a thoroughly scientific standpoint. The work has chapters on House Drainage, River Pollution, Irrigation, Ensilage, Precipitation, Sewage Sludge, and Filtration. The book has elaborate calculations of flow in sewers, and of discharges and velocities in oval and circular sewers.

THE HOUSE WARMING MANUAL. Compiled by Sidney P. Johnston. Chicago: The American Artisan Press. Pp. 270. Price $3.50.

This is a compilation of prize essays on the best method of heating a special house, the plans of which are given, by hot water, steam, and warm air. The different essays give dimensions of pipes and the location of the various parts of the apparatus, with detailed estimates of cost. One of the valuable points of the book is the discussion of the subject of ventilation.

BUILDING CONSTRUCTION AND SUPERINTENDENCE. By F. E. Kidder, architect. Part I. Mason's Work. Pp. 409. 8vo. 250 illustrations. Price $4.

This is a carefully prepared, handsomely printed book, intended as a guide in selecting materials for architectural masonry and giving the most approved methods of doing the various kinds of work, the latter being largely the result of the author's observation and experience. It has numerous valuable tables and an excellent chapter on specifications. A second volume in preparation by the same publisher will treat of wood construction and finishing.

RUHMKORFF INDUCTION COILS. By H. S. Norrie. New York: Spon & Chamberlain. Pp. 133. Price, paper 50 cents.

This is a handy little book designed to help the experimenter who desires to follow out some of the interesting phenomena which have recently assumed such importance in the electrical world. The construction and operation of the Ruhmkorff and Tesla coils are described, with chapters on contact breakers, condensers, spectrum analysis, currents in vacuo, primary and secondary batteries, etc, while the discussion of abstruse electrical theories is generally avoided.

MORRISON'S PRACTICAL ENGINEER AND MECHANIC'S GUIDE. By William A. Morrison. Boston: Published by the author. Pp. 144. Price $1.

This is an especially useful little handbook for mechanics who have come up to fill positions as engineers, without having been especially educated therefor. The author has filled important positions as an engineer, and the information given in the book is largely from the accumulations of his many years of practical experience.

MECHANICAL DRAWING: A COURSE FOR EVENING SCHOOLS AND SELF INSTRUCTION. By Louis Rouillion. Boston: The Prang Educational Company. Pp. 86 and 29 sheets of drawings. Price $1.25.

This is a most excellent and comprehensive work by the accomplished and highly successful professor of this specialty at the Pratt Institute, Brooklyn. The sheets and instructions cover the evening school work of two school terms of twenty-four weeks each, two or three evenings a week. The author has placed a good deal of valuable matter within small compass, and the style is so simple and direct that the youngest beginner will find no difficulty, with such help, in prosecuting the study of mechanical drawing.

MYTHS OF THE NEW WORLD. By Daniel G. Brinton. Philadelphia: David McKay. Pp. 360. Price $2.

The author of this work, a professor of American archæology and linguistics in the University of Pennsylvania, has written a series of books on the language and literature and the state of knowledge among the natives of America before the Europeans came here, and is acknowledged to be one of the leading authorities in this field. The present book is "a study of an obscure portion of the intellectual history of our country," aided by the light obtained through such investigations, and is thus intended more for the thoughtful general reader than the antiquary.

THE WHITE PINE: A STUDY. By Gifford Pinchot and Henry S. Graves. New York: The Century Company. Pp. 102. Price $1.

This excellently gotten up monogram on the most important lumbering tree in North America is primarily designed to hasten the general introduction of right methods of forest management. Mr. Pinchot has especial qualifications for speaking to some purpose on the subject, as he has been a consulting forester at Mr. Vanderbilt's Biltmore Forest, in North Carolina The naturalist will be pleased with the accuracy of detail and the commercial expert will be pleased with the valuable data given touching merchantable timber, etc.

A handsome catalogue has been issued by Pott's Shorthand College, of Williamsport, Pa., of which John G. Henderson is principal and proprietor. It has some fine half tone illustrations, and sets forth in plain and simple form some of the most important things to be considered and sought after by those taking up stenography as a means of livelihood.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue

Marine Iron Works. Chicago. Catalogue free.

"U. S." metal polish. Indianapolis. Samples free.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

Try us for manufacturing your wire or sheet metal specialties. The Enterprise Mfg. Co., Akron, O.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Carpenters.—Make more money. Go into concrete construction, Ransome system. 758 Monadnock Blk., Chi'go.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4, Munn & Co., publishers, 361 Broadway, N. Y.

Stay with your job, and with your wages pay installments for a profitable olive orchard. Booklet free. Whiting's Olive Colony, Byrne Building, Los Angeles, Cal.

Cripple Creek.—Its History to date, Illustrated. Just out, with correct map and costly full page views natural as life. This great book will be sent free prepaid with our big 56 col. family paper 3 months on trial for 25c. (stamps or silver); club of 5, $1. Latest mining news. Mention the SCIENTIFIC AMERICAN and address, Illustrated Weekly, Denver, Colo.

☞Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(6964) M. O. a ks a process for making a tooth soap like Wright's myrrh tooth soap, and the ingredients that enter into its manufacture. A. Vegetable Tonic tooth wash:

Soap bark ground	2 lb.
Water	1 gal.
Add honey	4 oz.

Simmer in warm water several hours; let it stand overnight; strain through muslin. To the fluid product add an equal amount of alcohol in which has been dissolved:

Gum myrrh	1 oz.
Oil teaberry	1 oz.

Color with red sanders, digest one week and filter.

(6965) C. E. P. says: Can you give me a receipt for a blondine solution that will bleach the hair white, and also one that will color it red? A. Gaseous chlorine and hydrogen peroxide are effectual agents in bleaching hair. The hair should be thoroughly cleaned, with a warm solution of soda, then washed with water. While moist it is put into a jar and chlorine gas introduced, until the air in the jar looks greenish. Allow it to stand for twenty-four hours, and if necessary repeat. We have no directions for coloring the hair red.

(6966) A. B. says: Can you give me formula of a compound fluid, which will plate all metals by rubbing it on with a soft rag. A. 1. Silver nitrate, 2 parts; salt, 2 parts; cream of tartar, 14 parts. Pulverize and mix. 2. For thin plating dissolve in 10 or 12 drops of water and add silver nitrate, 2 parts; potassium cyanide, 6 parts. Rub on the object.

(6967) W. L. M. writes: We have one telephone wire placed on telegraph poles four feet from telegraph wires, but our telephones repeat all messages passing. What causes it, as there is no connection except wood? A. It is caused by induction, and may need through metallic circuit to overcome the trouble.

(6968) G. A. F. says: I have mention in Steele's "Fourteen Weeks in Chemistry" of fusible metal, an alloy composed of bismuth, lead, and tin. Can you give me the proportions of the respective metals? A. 1. D'Arcets: Bismuth, 8; lead, 5; tin, 3 parts. This melts below 212° Fah. 2. Walker's: Bismuth, 8; tin, 4; lead, 5 parts; antimony, 1 part. The metals should be repeatedly melted and poured into drops until they can be well mixed, previous to fusing them together. 3. Onion's: Lead, 3; tin, 2; bismuth, 5 parts. Melts at 197° Fah. 4. If to the latter, after removing it from the fire, one part of warm quicksilver be added, it will remain liquid at 170° Fah., and become a firm solid only at 140° Fah. 5. Another: Bismuth, 2; lead, 5; tin, 3 parts. Melts in boiling water. Nos. 1, 2, 3, and 5 are used to make toy spoons to surprise children by their melting in hot liquors. A little mercury (as in 4) may be added to lower their melting points. Nos. 1 and 2 are specially adapted for making electrotype moulds. French cliche moulds are made with the alloy No. 2. These alloys are also used to form pencils for writing, also as metal baths in the laboratory or for soft soldering joints. No. 4 is also used for anatomical injections. Higher temperatures, for metal baths in laboratories, may be obtained by the following mixtures: 1 part tin and 2 parts lead melt at 441·5° Fah.; 1 part tin and 1 part lead melt at 371·7° Fah.; 2 parts tin and 1 part lead melt at 340° Fah.; 63 parts tin and 37 parts lead melt at 344·7° Fah.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

September 15, 1896,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Alarm. See Burglar alarm.
Albumen, obtaining, D. Finkler ... 567,706
Alloys of iron and chromium, producing, R. W. Wallace ... 567,757
Almond sheller, A. H. Cope ... 567,736
Anchor, H. A. House ... 567,680
Annunciator, street, H. P. Frear ... 567,643
Armature for dynamo electric machines, Haerer & Gikeleiter ... 567,746
Armor plates, apparatus to be used in manufacturing, W. Beardmore ... 567,876
Autographic register, J. N. Abbott ... 567,778
Autographic register, King & Carbart ... 567,785
Axle skein and box, J. Szalay ... 567,665
Axle support, revoluble, Curl & Faulkner ... 567,582
Band cutter and feeder, J. E. Fisher ... 567,587
Bathing apparatus, G. W. McLarty ... 567,915
Battery plate mould, C. G. Fawkes ... 567,705
Bearing axle, A. C. Stilson ... 567,697
Bearing, ball, C. H. Chapman ... 567,849
Bearing for cycles, etc., ball, W. J. Busse ... 567,732
Bedstead, E. J. Barcalo ... 567,731
Bedstead spring supporting frame, H. Quinn ... 567,656
Bed slide, M. Scheuer ... 567,692
Berth, self leveling ship's, J. Goodwin ... 567,708
Bicycle, W. S. Bellows ... 567,936
Bicycle, Fay & McNab ... 567,824, 567,825
Bicycle, C. Young ... 567,628, 567,631
Bicycle bearing, H. E. & J. F. Dodge ... 567,851
Bicycle brake, E. J. De Bergue ... 567,949
Bicycle brake, S. Logan ... 567,650
Bicycle handle bar, R. M. Snyder ... 567,663
Bicycle lock, T. Carroll ... 567,807
Bicycle saddle, R. O. Barler ... 567,634
Bicycle spring motor, C. Young ... 567,629, 567,630
Bicycle supporting frame, E. C. Waterman ... 567,625
Bicycle wheel, A. P. Le Gros ... 567,835
Bit. See Bridle bit.
Blackboard, K. L. Wemmell ... 567,758
Bobbin support or holder, O. E. Lafleur ... 567,647
Boiler. See Upright boiler. Water tube boiler.
Boiler, T. E. Button ... 567,940
Bone cutting machine, L. W. Gibson ... 567,854
Bookbinders' gluing machine, J. V. Galicher ... 567,742
Boot rack, W. S. Lambert ... 567,903
Bottle, Cooch & Lawrence ... 567,808
Bottle, L. M. La Rue ... 567,717
Bottle, P. L. Raymond ... 567,917
Bottle cap or nipple, mucilage, J. N. Clark ... 567,704
Bottle device, non-refilling, W. H. Payne ... 567,750
Bottle stopper, J. Flanigan ... 567,781
Bottle stopper, Ford & Schlundt ... 567,852
Bottle stopper, J. A. Woodworth ... 567,874
Bowling alleys, machine for planing, J. Emig ... 567,821
Box. See File box. Hat box. Paper box. Tooth powder box.
Bracket. See Ladder bracket.
Brake. See Bicycle brake. Vehicle brake.
Brake beam, Sullivan & Burnap ... 567,664
Bridge and automatic gate therefor, draw, W. E. Aston ... 567,875
Bridle bit, A. M. Pendleton ... 567,950
Bucket, milk, A. Ferber ... 567,679
Buggy wrench, H. S. Smythe ... 567,695
Buildings, protective system for, C. Burgher ... 567,577
Burglar alarm, W. H. Ward ... 567,845
Burglar alarm, O. B. Weaver ... 567,872
Burner. See Gas burner. Vapor burner.
Bushing, antifriction, B. F. Sparr ... 567,728
Button, R. J. Kyle ... 567,834
Can opener, E. N. Pike ... 567,722
Cane to carriers, apparatus for supplying sugar, G. Lorio ... 567,906
Car coupling, J. Callantine ... 567,678
Car coupling, A. F. Kuhlmann ... 567,902
Car coupling, C. S. Park ... 567,770
Car coupling, H. Schaeffer ... 567,866
Car fender, W. J. McClenahan ... 567,914
Car signaling light, M. P. Crawford ... 567,941
Car, street railway, C. W. Teller ... 567,798
Cars, automatic sanding apparatus for railway, W. T. Hamilton ... 567,856
Cars, etc., combined seat and berth for railway, S. Udstad ... 567,819
Cars, movable arm support for, G. H. Poor ... 567,655
Cards, playing, S. Kimble ... 567,646
Carriage, baby, D. Weinstock ... 567,669
Case. See Packing case.
Cattle guard, F. G. Susemihl ... 567,844
Cellulose from resin, apparatus for freeing sulphite, L. Engelmayer ... 567,823
Chair, V. A. Menuez ... 567,837
Chair seat, W. Crouch ... 567,639
Charging apparatus, H. H. Campbell ... 567,848
Chariot, cycloidal, W. D. Cronin ... 567,580, 567,581
Chimney top, J. Watson ... 567,775
Churn, Roberts & Vermillion ... 567,726
Cigar cutter and lighter, combined, P. J. Caesar ... 567,578
Cigar head perforating machine, C. Matz ... 567,947
Cigarette machines, tape or belt for continuous, R. Hardie ... 567,644
Clipper, Curtis & Atwater ... 567,583
Cloth finishing machine, electromagnetic pin extractor attachment for, A. C. Shuttleworth ... 567,619
Clothes line support, G. Yung ... 567,800
Cock, Dewrance & Wall ... 567,584
Coin controlled apparatus, M. Barnes ... 567,761
Comb. See Hair cutter's comb.
Commutation tack, E. Stockwell ... 567,698
Commutator, Haerer & Gikeleiter ... 567,745
Contact device, F. W. N. E. Hayn ... 567,899
Conveyer, endless bucket, T. L. Marvel ... 567,683
Cooker, steam, T. C. Maddux ... 567,858
Corn, separating and collecting germs from, J. G. O'Neill ... 567,790
Cornstalk cutter, J. B. Forbes ... 567,893
Corset, C. W. Gregg ... 567,855
Counter attachment for suspending barrels, G. A. Doyle ... 567,891
Coupling. See Car coupling. Pipe coupling.
Coupling device, J. Rieppel ... 567,614
Culvert, W. S. Parker ... 567,653
Curler, hair, A. Fosgate ... 567,767
Cut out, automatic, H. F. Parshall ... 567,608
Cutter. See Band cutter. Cigar cutter. Cornstalk cutter.
Cutter head and bit, S. J. Shimer ... 567,815
Cycle saddle, J. B. Brooks ... 567,882, 567,883
Cycling machine driving gear, J. J. Marshall ... 567,787
Dental excavator, E. M. Fredericks ... 567,589
Die. See Metal drawing die.
Digging machine, earth, J. H. Stephens ... 567,622
Direct acting engine, J. G. Leyner ... 567,682
Dish cleaner, N. F. Olson ... 567,769
Display device, W. H. Knautz ... 567,857
Dividers, C. Klaui ... 567,810
Doubletree, G. G. F. Boswell ... 567,939
Draw plate, McCool & Algeo ... 567,606
Drawer attachment, A. L. Smith ... 567,693
Drying machine, steam, H. Cutler ... 567,887
Dust and draught arrester, H. C. Schoyer ... 567,922
Dye, blue azo, F. Runkel ... 567,615
Egg beater, H. W. Mason ... 567,909
Egg whisk, T. A. Moody ... 567,684
Electric contact device, R. Skeen ... 567,816
Electric cut out and annunciator, J. Kips ... 567,599
Electric machine, dynamo, G. E. Dorman ... 567,586
Electric machine, dynamo, H. W. Libbey ... 567,719
Electric motors, automatic regulator for, H. P. Merriam ... 567,651
Electric signal, C. P. Wilkinson ... 567,759
Electric track signal, C. P. Wilkinson ... 567,760
Electrical condenser, N. Tesla ... 567,818
Electricity, producing, J. R. Payson, Jr ... 567,721
Embossing roller, Redeker & Timmerwilke ... 567,918
Engine. See Direct acting engine. Steam engine.
Engine, F. C. Rinsche ... 567,725
Engine steering device, traction, G. C. Stevenson ... 567,696
Fabric and producing finished edges thereon, T. W. Bracher ... 567,948
Farm gate, W. H. H. West ... 567,670
Faucet, liquid, J. H. Beare ... 567,877
Fence wire winding device, C. Heitsch ... 567,713
Fence wiring machine, W. A. Dillon ... 567,885
File box or document case, A. C. Barler ... 567,633
Fire dog, H. J. Lewis ... 567,786
Fire escape, M. R. Fitzhugh ... 567,642
Fly screen, W. L. Gordon ... 567,828
Food compound, J. H. Kellogg ... 567,901
Fruit jar, P. Philip ... 567,610
Fruit pitter, Allman & Ingham ... 567,702
Furnace. See Smelting furnace.
Furnace, R. L. Fuciata ... 567,611
Furniture, adjustable, G. A. Bobrick ... 567,762
Furniture, changeable, J. Horneburg ... 567,595
Furrower, marker and coverer, combined, A. S. Linthicum ... 567,904
Game board, W. A. Conklin ... 567,885
Garbage, apparatus for treatment of, W. S. Richardson ... 567,724
Garment fastening, S. Spaugh ... 567,843
Garment stretcher, L. B. Cadmus ... 567,733
Gas burner, A. Wanner, Jr ... 567,870
Gas generating apparatus, H. Eldridge ... 567,641
Gas holder, R. M. Dixon ... 567,764
Gate. See Farm gate. Railway gate.
Gate, M. C. Malter ... 567,908
Gate, J. W. Reynolds ... 567,772
Glass bottles, etc., machine for manufacturing, C Emmet ... 567,739
Glove, D. F. Morgan ... 567,749
Grain binder, W. W. Burson ... 567,847
Grain binder, L. J. Fellay ... 567,826
Grain binders, knot tying device for automatic, G. H. Ellis ... 567,737
Grain binders, knotting mechanism for automatic, J. F. Appleby ... 567,932
Grate, combined gas and coal, C. H. Miller ... 567,812
Grinding machine, A. R. Clizbe ... 567,637, 567,638
Hair cutter's comb, P. W. Mathews ... 567,910
Handle bar, adjustable, Galt & Rankin ... 567,853
Harness, H. C. Detzer ... 567,850
Harvester, J. F. Appleby ... 567,933
Harvester, potato, J. P. Brennan ... 567,846
Harvester, self binding, J. F. Appleby ... 567,934
Harvesters, knotting mechanism for twine binding, G. W. Whittington ... 567,627
Harvesters, tension device for self binding, J. F. Appleby ... 567,803
Harvesting machinery, J. F. Appleby ... 567,935
Hat box or holder, J. W. Vogt ... 567,929
Hats and hat brims, apparatus for pressing, shaping and curling, G. Atherton ... 567,573
Hay and fodder rack, combined, T. Meyer ... 567,838
Heat, apparatus for utilization of solar, M. L. Severy ... 567,618
Heater. See Water heater.
Heating apparatus, M. F. Beal ... 567,575
Heating system, hot water, W. H. Hallowell ... 567,593
Hinge, spring, J. Schlutter ... 567,727
Horseshoe, B. G. Fox ... 567,740
Hub attaching device, F. A. Manegold ... 557,946
Hub boring device, C. E. Roberts ... 567,795
Hydrocarbons, apparatus for treating, A. Seigle ... 567,752
Igniting device, H. Van Hoevenbergh ... 567,928
Indicator. See Station indicator.
Inkstand, J. L. Powley ... 567,792
Insect powder distributer, C. D. Cutts ... 567,640
Insulator crossover for trolley wires, A. Hanson ... 567,784
Jar. See Fruit jar
Joint. See Pipe joint.
Kettle holder and strainer, W. G. Bolus ... 567,763
Kneader, dough, W. J. Woods ... 567,777
Knitting machine needle, S. Woodward ... 567,931
Ladder bracket, adjustable, H. M. Stillman ... 567,755
Ladder, portable extension, W. Ornatowski ... 567,814
Lamp, J. Kirby, Jr ... 567,833
Lamp, electric arc, J. McLaughlin ... 567,840
Lamp, electric arc, P. R. Salberg ... 567,691
Lamp, gas generating, F. Rossbach-Rousset ... 567,773
Lamps, automatic flame extinguisher for, E. J. Brown ... 567,677
Lantern, miner's, H. Delzell ... 567,889
Lathe tool holder, N. Nelson ... 567,685
Lawn rake, W. H. Lewis ... 567,602
Lawn sprinkler, G. H. Newell ... 567,916
Lifter. See Stove lifter.
Lifting device, O. T. Jensen ... 567,681
Limb, artificial, B. F. Rounds ... 567,774
Liquids, apparatus for treating, A. Seigle ... 567,751
Liquids, device for applying, Kilmer & Randel ... 567,598
Loading machinery, wagon, W. E. Ewbank ... 567,765
Lock. See Bicycle lock. Combination lock. Permutation lock. Pin lock. Time lock.
Lock, S. Piotrouski ... 567,687
Lock jaw wrench, E. L. Keith ... 567,945
Locomotive, J. P. Serve ... 567,617
Locomotive, electric, S. H. Short ... 567,662
Loom, lappet, D. Scott ... 567,923
Lubricator, G. B. Miller ... 567,788
Mail, etc., apparatus for collecting, H. W. Libbey ... 567,718
Mail collecting pouch, D. di B. Savorgnan ... 567,920
Mandrel, expansible, H. W. Rose ... 567,658
Manuscript holder, W. L. Salvage ... 567,660
Match making machine, J. M. Van Doren ... 567,927
Metal bending machine, H. Lefevre ... 567,811
Metal drawing die, McCool & Algeo ... 567,605
Metal plates, etc., apparatus for manufacturing rolled, S. M. Strite ... 567,756
Milling machine, A. J. Langelier ... 567,952
Mould. See Battery plate mould.
Moulding machine, automatic, J. W. Brown, Jr ... 567,884
Motor. See Bicycle spring motor.
Motors, regulating admission of current to, F. E. Herdman ... 567,714
Nozzle, spray, J. D. Shoots ... 567,925
Oiling device for trolley wheels, A. W. Gabrio ... 567,783
Opera glass, folding, Densmore & Briggs ... 567,892
Ordnance, gas operated, H. S. Maxim ... 567,604
Oyster tongs, F. Paschen ... 567,791
Packing case for food products, metal, L. H. Blanke ... 567,938
Paint, water, W. A. Hall ... 567,592
Paper box, A. F. Girard ... 567,897
Paper cutting and trimming machine, guillotine, A. Bradley ... 567,576
Paper making machines, pulp feed regulator for, R. E. Blasser ... 567,636
Paper receptacle, J. J. Lanzit ... 567,649
Patterns, producing and coating, W. P. Smith ... 567,694
Pegging horn, Whittemore & Glass ... 567,626
Penholder, J. E. Murphy ... 567,789
Permutation lock, S. C. Houghton ... 567,900
Phonograph diaphragm clamp, V. H. Emerson ... 567,738
Photographic plate holder, A. O. Kaiser ... 567,596
Photographs in relief, producing, T. C. Marceau ... 567,748
Piano, F. Teupe ... 567,668
Piano action parts, automatic machine for producing, Shaller & Chapman ... 567,796
Pigeonholes, display drawer attachment for, J. D. Warren ... 567,820
Pin lock, W. H. Taylor ... 567,624
Pipe coupling, J. W. Cloud ... 567,735
Pipe joint, J. A. Nelson ... 567,862
Pipe wrench, W. Houghton ... 567,715
Pitcher or pot, F. Zahn ... 567,801
Pneumatic dispatch tube switch, C. F. Pike ... 567,654
Pole, adjustable carriage, E. Funk ... 567,707
Pop corn fritter machine, W. Z. Long ... 567,836
Pot or pitcher, F. Zahn ... 567,802
Press, K. S. Blanchard ... 567,635
Printing, Beck & Hamilton ... 567,878
Printing or impressing designs, patterns or outlines for garments, apparatus for, H. E. Couzineau ... 567,886
Printing press impression adjustment, C. O. Duffy ... 567,892
Printing press, web, E. H. Wilcomb ... 567,776
Printing presses, apparatus for inking and wiping dies in, R. H. Syms ... 567,797
Printing presses, front edge sheet registering mechanism for, H. A. W. Wood ... 567,730
Printing, producing relief plates for, O. C. Strecker ... 567,926
Pulp, apparatus for dissociating wood, L. Engelmayer ... 567,822
Pump bucket, chain, N. W. Hartman ... 567,712
Pump valve, air, E. W. Koster ... 567,600
Pumping apparatus, P. Frichette ... 567,741
Puzzle, J. F. Brittingham ... 567,804
Rack. See Boot rack. Hay and fodder rack.
Rail fastening device, F. W. Wilson ... 567,873
Railway bond, electric, J. McLaughlin ... 567,841
Railway crossing signal, C. Selden ... 567,753
Railway gate, W. G. Roome ... 567,657
Railway switch, C. Hoerl ... 567,645
Railway switch, street, A. Schmackers ... 567,921
Railway tie, metallic, S. F. Adams ... 567,632
Railways, self acting caution and danger signal for, W. T. C. Pratt ... 567,865
Raisin seeder, J. H. Bullard ... 567,806
Rake. See Lawn rake. Sweep rake.
Range finder, Barr & Stroud ... 567,675
Ratchet wrench, M. Fisk ... 567,766
Recording slip, W. A. Hawley ... 567,594

© 1896 SCIENTIFIC AMERICAN, INC.

Refrigerator car door. C. Bouchard 567,880
Register. See Autographic register.
Ribbon roll core, G. E. Grimm 567,898
Roller. See Embossing roller.
Roofing plate, metallic, F. M. Vogan 567,700
Rule and try square, combined, G. W. Snyder 567,809
Ruler and marker, combined, C. Schnorberger 567,616
Saddle, H. Briggs 567,881
Sandpapering machine, J. B. Locke 567,905
Sash fastener, Reilly & Ziegler 567,689
Sash fastener, L. C. Smith 567,620, 567,621
Saw guide, band, J. A. Martin 567,859
Screen. See Fly screen. Vehicle wind screen.
Scrubbing machine, J. S. Hitchcock 567,944
Seeder, J. Custer 567,780
Selvage on fabrics, machine for making, T. W. Bracher 567,779
Separator, A. F. Gaiennie 567,894, 567,895
Sewing machine, C. Danecl 567,888
Sewing machine, T. A. Macaulay 567,603
Sewing machine attachment, P. Olson 567,652
Sewing machine clamping device, buttonhole, R. L. Plumley 567,723
Sheller. See Almond sheller.
Sifter. A. Hanson 567,711
Sign, interchangeable electric, Scott and Shonnard 567,924
Signal. See Electric signal. Electric track signal. Railway crossing signal.
Signal operating device, J. L. Keefe 567,716
Slot machine, C. F. Neubert 567,683
Smelting furnace, electric, J. A. Vincent 567,699
Soap, process of and apparatus for moulding, J. Clark 567,734
Soldering block, V. H. Ballard 567,674
Spark arrester, T. Lee 567,601
Spinning frame builder mechanism, C. Whitaker 567,930
Spool holder, J. H. Griffith 567,743
Sprinkler. See Lawn sprinkler.
Square, J. P. Johns. 567,832
Station indicator, O. J. Merritt 567,911
Station indicator striker arm, O. J. Merritt 567,912
Steam engine, W. B. Brown 567,805
Steam engine. P. Lersch 567,747
Stoker, coal, W. H Hannan 567,710
Stopper. See Bottle stopper.
Store service apparatus, J. J. Weldon 567,701
Stove, lamp, J. Hirschhorn 567,943
Stove lifter suspending device, J. L. Kerstetter.. 567,597
Suspenders, Holt & Eldred 567,831
Sweep rake, A. Punteney 567,771
Switch. See Pneumatic dispatch tube switch. Railway switch. Telephone switch.
Tag making and stringing machine, J. Fletcher.. 567,809
Tank, F. G. Tallerday 567,666, 567,667
Tapping head, J. Riddell 567,793
Telephone, R. F. Rankin 567,688
Telephone switch, E. E. Ries 567,794
Telescope in combination with compasses, R. Schmidt 567,867
Thill shifter, vehicle. G. W. Snyder 567,817
Thrashing machine, H. H. Lamont 567,648
Tie. See Railway tie.
Time lock. E. Stockwell 567,623
Tin plate, toughening, chilling and cleaning, W. F. Herbert. 567,830
Tinning or galvanizing metals, A. S. Ramage 567,612
Tire, pneumatic, J. G. Moomy. 567,839
Tire tightener, S. & T. Forbes. 567,782
Tobacco, apparatus for packing leaf, T. Gibon 567,896
Tool handle fastening, Bohy & Fritz 567,676
Tooth powder box, J. P. Hendrick, Jr. 567,942
Toy, optical, R. Pilkington 567,863
Transportation, means for, S. A. Mustain.. 567,861
Tree limb supporter, fruit, E. Morgan 567,813
Trolley catcher, O. R. Sackett 567,690
Trolley contact device, R. Skeen 567,754
Trolley guard, F. S. Birth 567,879
Trough. See Watering trough.
Truck, car, T. C. Du Pont 567,864
Truck frame, car, R. Cliff 567,579
Trucks, journal and journal box for railway, Abbenzeller & Faunce 567,673
Twisting machine. fringe, W. Gledhill 567,590
Typewriting machine, Blackstock & Conley 567,937
Typewriting machine, G. B. Webb 567,799
Umbrella sheath, H. Gochnauer 567,827
Upright boiler, P. J. McGrath 567,768
Valve mechanism for water gas apparatus. O. N. Guldlin 567,709
Valve operating mechanism, engine, J. D. Williamson, Jr. 567,671
Vapor burner, hydrocarbon, H. Ruppel 567,659
Vehicle brake, C. B. Fairchild 567,951
Vehicle stop, W. F. Redding 567,842
Vehicle wind screen, T. L. Monaghan 567,850
Veil fastener, C. E. Luce 567,907
Vessels, apparatus for raising sunken, F. Guttenberg 567,744
Violin, McKenzie & Rising 567,607
Voting machine, ballot printing, A. O. Abbott 567,572
Wagon top board fastener, J. M. Haines 567,591
Waistband support, C. V. Richards 567,613
Washing and starching machine, S. Barrett 567,574
Washing machine, G. R. Chesnut 567,703
Washing machines, automatic water regulator for, E. Wilson 567,729
Water heater, Simons & Hixon 567,868
Water, purifying, T. Royle 567,919
Water purifying apparatus, J. B. Greer 567,829
Water tube boiler, vertical, M. Miller 567,913
Watering trough, A. H. Wilson 567,672
Winding apparatus, cop, S. W. Wardwell, Jr. 567,871
Window, Sanford & Kilby 567,661
Wood grinding apparatus, E. F. Millard 567,720
Wrench. See Buggy wrench. Lock jaw wrench. Pipe wrench. Ratchet wrench.
Wrench, J. M. Flower 567,588

TRADE MARKS.

Boots and shoes, James A. Banister Company 28,877
Boots and shoes, men's, boys', youths', women's misses' and children's, B. A. Corbin & Son. 28,875, 28,876
Dental chairs, amalgams, alloys, and teeth filling materials, Consolidated Dental Manufacturing Company 28,882
Filters, United States Universal Filter Company.. 28,883
Lamp burners, Scovill Manufacturing Company ... 28,884
Lard, leaf, Parker, Webb & Company 28,880
Lye or soda, caustic, Pennsylvania Salt Manufacturing Company 28,881
Mineral waters and medicinal preparations containing the same, J. E. Paul 28,878
Salt, sugar and spices or other condiments, excepting baking soda, saleratus and baking powders, R. N. Fitzgerald 28,879

DESIGNS.

Badge, C. W. Lemaster 26,016
Badge or pin, campaign, W. R. Dutemple 26,013
Badge pin, M. V. Hammack 26,014, 26,015
Bicycle crank shaft, W. S. Ward 26,032
Bicycle shaft and crank, W. S. Ward 26,031
Box, G. B Hurd 26,025
Button, F. B. S. Beardsley 26,012
Calendar stand, A. Ferber 26,026
Can, ash, E. Ettenheimer 26,041
Carpet, A. K. May ..... 26,046 to 26,055
Carpet, A. M. Rose 26,056, 26,057
Corset, A. J. Claveloux 26,044
Cycle hanger, G. Lane 26,033
Drinking vessel, F. P. Derr 26,023
Electric light fixture, S. H. Davis 26,034
Filter case, liquid, J. Ellis 26,029
Game board, F. J. Candee 26,042
Garment support, W. H. Kellogg 26,021
Gas burner, J. Lines 26,036
Gas or vapor burner, C. F. Allen 26,035
Guitar, C. Knutsen 26,043
Ironing tool, O. A. Miller 26,040
Knife or fork handle, H. C. Hart 26,017
Knife or scraper, W. P. McConnel 26,019
Knives, forks, etc., handle for, J. L. Wallace 26,018
Lamp shade holder, W. E. Ball 26,022
Nozzle, Park & Williston 26,028
Padlock case, W. H. Taylor 26,039
Plate, I. La Ferte 26,024
Pulley block, W. J. & G. Lane 26,038
Razor wiper, P. J. Bertucci 26,020
Saddle pommel plate, E J. Toof 26,030
Screw, thumb, F. C. Von Heydebrand und der Lasa 26,027
Stove bottom plate, A. Ohnemus 26,037
Woven fabric, H. W. Smith 26,045

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York. Special rates will be given where a large number of copies are desired at one time.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

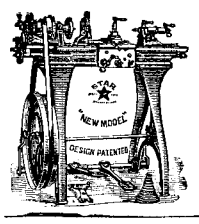
ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line

Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.



Star Lathes ★ Foot power Screw... ...cutting Automatic Cross feed

9 and 11-inch Swing.

New and Original Features

Send for Catalogue B.

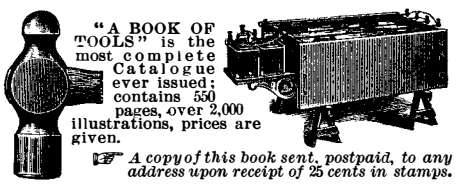
Seneca Falls Mfg. Company, 695 Water St., Seneca Falls, N.Y.

AMERICAN PATENTS.—AN INTERESTING and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31, 1894. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1002. Price 10 cents. To be had at this office and from all newsdealers

POWER & FOOT LATHES. SHAPERS, PLANERS, DRILLS, MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. CATALOGUE FREE. SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

A Book of Tools

You want to know about Hammers or Nickel-Plating Outfits? Then send for "A Book of Tools."

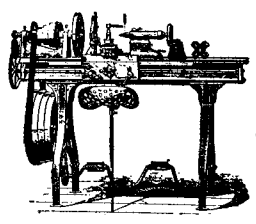


"A BOOK OF TOOLS" is the most complete Catalogue ever issued; contains 550 pages, over 2,000 illustrations, prices are given.

☞ *A copy of this book sent, postpaid, to any address upon receipt of 25 cents in stamps.*

CHAS. A. STRELINGER & CO.

Address Box 12½, Adv. Dept. DETROIT, MICH.



LATHES FOR GUNSMITHS, TOOL MAKERS, EXPERIMENTAL AND REPAIR WORK, ETC.

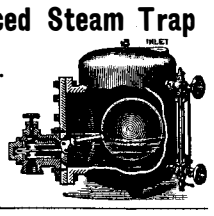
Send for Illus. Catalog.

W. F. & Jno. Barnes Co. 1999 Ruby Street, ROCKFORD, ILL.

The Curtis Balanced Steam Trap

Combines more Superior Features than any other Trap in the market.

☞ *Send for circular S. C. giving particulars.*



D'ESTE & SEELEY CO.

29-33 Haverhill St., BOSTON.

THE COBURN PATENT TROLLEY TRACK

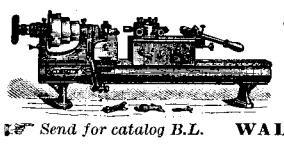
HOUSE DOOR HANGERS

The first made with adjustable track. The track can be put up in 30 minutes.

☞ *Send for Book.*

The Coburn Trolley Track Mfg. Co., Holyoke, Mass.

Stark No. 4 Bench Lathe

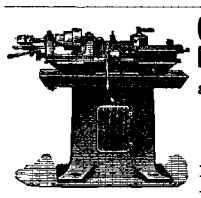


with Automatic Turret Head

JOHN STARK

☞ *Send for catalog B.L.* WALTHAM, MASS.

Tuerk Bros., 35-45 West Randolph Street, Chicago, Ill. Chas. Churchill & Co. Ltd., 21 Cross Street, Finsbury, London. E. C., England.



Screw Machines and General Line of Machine Shop Tools.

Hill, Clarke & Co.

160 Oliver St., BOSTON.

16 S. Canal St., Chicago.

MANUFACTURE OF BICYCLES.—A very comprehensive article giving the details of construction of every part of these vehicles. With 15 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 908. Price 10 cents. To be had at this office and from all newsdealers.

BUY TELEPHONES

That Are Good--Not Cheap Things

The Richmond, Ky., Telephone Co. tried other apparatus, which failed to operate satisfactorily and speak highly for the "Western" put in place of it.

Hundreds of similar cases may be cited affecting the apparatus of nearly all so-called competitors.

WESTERN TELEPHONE CONSTRUCTION CO.

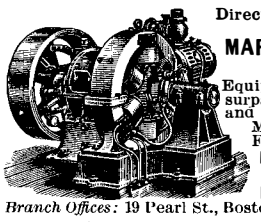
250 South Clinton Street, Chicago

The Largest Manufacturers of Telephones in the U. S.

DEFIANCE MACHINE WORKS

DEFIANCE, OHIO, U.S.A. BUILDERS OF HUB, SPOKE, WHEEL, BENDING, WAGON, CARRIAGE AND HOOP MACHINERY. SEND FOR CATALOGUE

PATENT SPOKE DRIVER



Direct Coupled Engines and Dynamos for MARINE and LOCAL LIGHT PLANTS

Equipment complete and unsurpassed. Electric Motors and Dynamos, Bipolar and Multipolar. ⅛ to 150 h. p. For particulars, address

BELKNAP MOTOR CO.

HOME OFFICE, Portland, Me., U. S. A.

Branch Offices: 19 Pearl St., Boston. Thames Bldg., N.Y.

HARVEY HUBBELL

Machinery and Tool Mfr.

Improved Tapping Machines

SCREWS

Machine Screws for electrical purposes. Sample box free.

BRIDGEPORT, CONN.

SENSITIVE DRILL

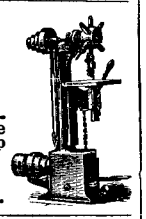
A tool adapted for light drilling. Constructed specially for the use of Bicycle Manufacturers.

C. N. CADY,

West Center Street, Canastota, N. Y.

... QUINT'S ...

Turret Drills



Adapted for jig drilling, bicycle, electrical, or any medium sized machine work. Will drill, ream, hub mill and tap without moving work.

A. D. QUINT,

4 Clinton St., Hartford, Conn, U. S. A.

STEAM STAMP FOR CRUSHING ORES

Cheapest to install and operate. Capacity guaranteed. Catalogs sent.

GATES IRON WORKS, CHICAGO.

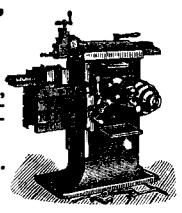
DO YOUR OWN PRINTING

$5. PRESS for cards, circulars, &c Press for printing a small paper, $40.

Save money! Make money printing for others! Type-setting easy. Printed rules Write for catalogue, presses type, cards, etc., to factory.

KELSEY & Co. Meriden, Conn

THE "SPRINGFIELD" 15 and 20 inch **CRANK SHAPERS.**



Most Convenient, Simple, Strong, and Durable Shapers in the market. Has many points of superiority over others.

Send for Circular C S. Address

SPRINGFIELD MACH. TOOL CO.

Southern Avenue, Springfield, Ohio, U. S. A.

Durable—Easily Applied.

This roofing is manufactured from natural Trinidad asphalt materials, and will not dry up and become brittle under exposure to the weather as coal-tar roofings do. ☞ *Send for free sample of roof 12 years old, with circular and price list to*

WARREN CHEMICAL & MFG. CO., 85 Fulton Street, New York, U. S. A.

A Boiler Feeder For High Pressures

WORKS AT 150 TO 250 LBS. STEAM as easily as OUR STOCK INJECTOR AT 25 TO 150 LBS.

May we tell you about it?

PENBERTHY INJECTOR CO., 116 Seventh Street, DETROIT, MICH.

DROP FORGINGS WYMAN & GORDON WORCESTER, MASS. 28 BRADLEY STREET.

Towers, Tanks and Tubs

PATENT SECTIONAL

ALL IRON TOWERS

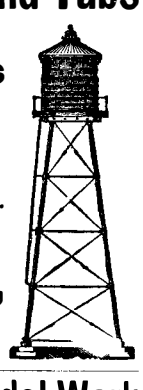
PLAIN

ALL WOOD TOWERS.

ELEVATED TANKS

for Automatic Fire Sprinkler Plants.

Louisiana Red Cypress Tanks a Specialty.



W. E. CALDWELL CO.,

219 E. Main Street,

LOUISVILLE, KY., U. S. A.

Experimental & Model Work

Circulars & advice free. Gardam & Son, 96 John St., N.Y.

IMPROVED ADJUSTABLE "S" WRENCH.

Easily operated. Free and Accurate

Strong, Durable. For Circular, address

BEMIS & CALL HARDWARE & TOOL CO. P. O. Box 1400, Springfield, Mass., U. S. A.

Architecture Taught by Mail Thorough Practical

Architectural and Mechanical Drawing; Electricity; Mechanics; Plumbing; Mining; Civil Engineering in all Branches; Steam Engineering (Loco., Stat'y and Marine)

The International Correspondence Schools

To Carpenters,

Machinists, Electrical Workers, Plumbers, Steam Fitters, Pattern Makers, Steam Engineers, Draughtsmen, Miners, Civil Engineers, etc. *References Everywhere. Free Circular. State Subject you wish to Study.*

B 942 Scranton, Pa.

AUTOMOBILE CARRIAGES; THE Paris-Bordeaux-Paris Race of.—Brief account of the performance of the vehicles that obtained the prizes in the competition instituted by the Petit Journal. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1023. Price 10 cents. To be had at this office and from all newsdealers.

PERFORATED METAL OF EVERY DESCRIPTION AND FOR ALL USES
THE HARRINGTON & KING PERFORATING CO.
225 NORTH UNION STR CHICAGO ILL. U.S.A.
AND 284 PEARL ST NEW YORK

-- THE --

SCIENTIFIC AMERICAN

☞ ESTABLISHED 1845.

The Most Popular Scientific Paper in the World

Only $3.00 a Year, Including Postage. Weekly--52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year* - 52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of Three Dollars by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Postmasters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 361 Broadway, New York.

Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography. Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT, for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check,

MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN BUILDING EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates* and other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Floor Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., 361 Broadway, New York.

Export Edition

of the SCIENTIFIC AMERICAN, with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN is published monthly, and is uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places *throughout the world.* $3.00 a year, postpaid, to any part of the world. Single copies, 25 cents.

☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost. Rates upon application.

MUNN & CO., Publishers. 361 Broadway, New York.

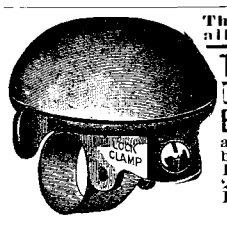
© 1896 SCIENTIFIC AMERICAN, INC.

The Advertisement Writer...
should subscribe for THE INLAND PRINTER. Its advertisements are an object lesson in type composition. He should advertise in it also, and get his name before 11,000 readers every month. Subscriptions, $2.00 per year; $1.00 for 6 months. The Inland Printer Company, 212-214 Monroe Street, Chicago; 197 Potter Building, 38 Park Row, New York.

"THE LIGHT RUNNING" **DENSMORE**

Everybody knows how much easier it is to raise a weight on an inclined plane than to lift it vertically. That's where the light stroke of the Densmore comes in. Our free pamphlet tells the rest.

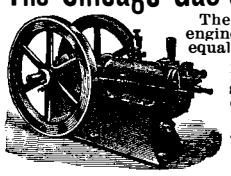
FROM THE U. S. GOVERNMENT.
DEPARTMENT OF THE INTERIOR,
Washington, Nov. 23, 1895.
Densmore Typewriter Company.
Gentlemen:—We have now in use in the Bureaus of this Department nearly eighty Densmore machines. We have no complaint from the users of them; hence we conclude they are giving entire satisfaction. Respect'y,
(Signed) HIRAM BUCKINGHAM, *Custodian.*
DENSMORE TYPEWRITER CO., 316 Broadway, N. Y.



They have a tone that's all their own . . . . .
THE NEW DEPARTURE BELLS are the standard of excellence the world over. Made in 16 different styles and prices. Send postal for booklet to THE NEW DEPARTURE BELL CO., 210 North Main Street, Bristol, Conn., U. S. A.

WIRE Machinery for making any articles from **WIRE**
Automatic wire forming machine department is in charge of R. C. Manville.
Machinery for making sheet metal goods.
THE WATERBURY MACHINE CO.,
P. O. Box 1025,
WATERBURY, CONN., U. S. A.

The Chicago Gas & Gasoline Engine



The simplest gas and gasoline engine on the market. Has no equal for absolute, steady speed and durability. It is a dwarf in size and a Samson in strength. *Catalogue sent on application.*
MANUFACTURED BY
J. J. NORMAN CO.,
48 "A" South Clinton St.,
CHICAGO, ILL.

GREAT REDUCTION IN
RUSSIAN PATENTS
NEW LAW NOW IN FORCE.

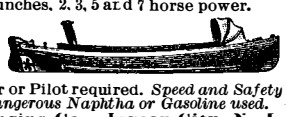
On the 13th of July, a new Russian patent law went into effect, reducing the cost of obtaining the patent and increasing the term to 15 years. We can now procure a Russian patent for $125 in ordinary cases. The price formerly was from $200 to $450 for a patent of from 3 to 10 years. Annual taxes will be payable. The application should be filed before the issue of the United States patent.

Patents granted under the old law may, if still in force, be extended to the full term of 15 years, counting from the original date, by paying all the annuities that would have become due if the new law had been in operation at the time the application was filed.
For full particulars address,
MUNN & CO., 361 Broadway, New York.

If you want the best Lathe and Drill
CHUCKS

BUY WESTCOTT'S. *Strongest Grip, Greatest Capacity and Durability, Cheap and Accurate.*
Westcott Chuck Co., Oneida, N. Y., U. S. A.
Ask for catalogue in English, French, Spanish or German.
FIRST PRIZE AT COLUMBIAN EXPOSITION, 1893.

ALCO VAPOR LAUNCH
Engine and Helm Controlled from Bow
Latest improved and only 12 to 1 Motor now ready for the market. 18 to 40 ft. Launches. 2, 3, 5 and 7 horse power.



No licensed Engineer or Pilot required. *Speed and Safety Guaranteed. No Dangerous Naphtha or Gasoline used.*
Marine Vapor Engine Co., Jersey City, N. J.

MODELS & GEARS EXPERIMENTAL WORK CATALOGUES FREE UNION MODEL WORKS CHICAGO

FOR SALE!
Three 50 horse power Lowe Boilers, pressure inspection at 80 lbs. per square inch, which are in good condition, in use and can be seen. Must be disposed of by October 1st, to make room for others. Also one 300 lb. Bement & Miles Steam Hammer in good condition. Address all comunications to The Union Metallic Cartridge Company, Bridgeport, Conn.

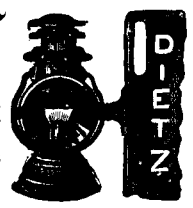
LINENE TRADE MARK **REVERSIBLE COLLARS AND CUFFS.**

MADE OF FINE CLOTH IN ALL POPULAR STYLES.
Equal in Fit and Wear to finest linen
Not to be laundered; when soiled reverse, then discard.
LUXURIOUS and ECONOMICAL.
Sold at all leading Gents' Furnishing Stores, but if not found send **twenty-five cents** for a box of **ten Collars** or **five pairs of Cuffs**, naming the size and style.
☞ *Sample Collar and pair of Cuffs sent for* **6 CENTS.**
REVERSIBLE COLLAR CO. 69 Milk St., Boston, Mass.

HYPNOTISM Sixty methods, $5; my process $2, 100 page book, 10c. Key to Power, 30c. Prof. Anderson, S. A. 10, Masonic Temple, Chicago

STUDY AT HOME
BY OUR EFFICIENT CORRESPONDENCE METHOD,
ELECTRICITY, MECHANICAL DRAWING, MECHANICS, OR STEAM ENGINEERING. 72-page Catalogue Free.
INSTITUTE FOR HOME STUDY OF ENGINEERING,
46-47 Blackstone Building, CLEVELAND, OHIO

TUBULAR DRIVING LAMP.



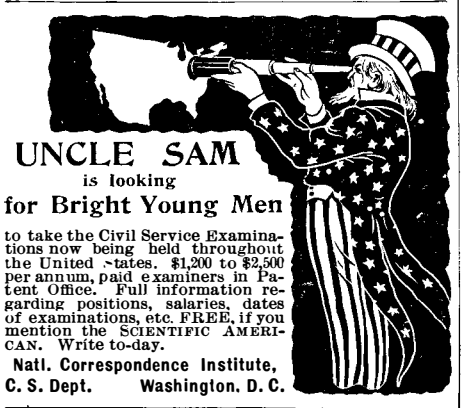
IT is the only perfect one.
IT will not blow or jar out.
IT gives a clear, white light.
IT is like an engine headlight.
IT throws the light straight ahead from 200 to 300 ft.
IT burns kerosene,
Send for book (free).
R. E. DIETZ CO., 60 Laight Street, New York.
Mention this paper and get special discount.
ESTABLISHED 1840.

WATER MOTORS
GAS ENGINES & VENTILATING FANS
The best Motor in the world for driving all kinds of light machinery, noiseless, neat, compact; invaluable for blowing church organs, running printing presses, coffee mills, ventilating fans, ice cream freezers, meat choppers, etc. In use the world over, and recommended by water companies everywhere. Address for circular, Backus Water Motor Co., Newark, N. J., U.S.A.

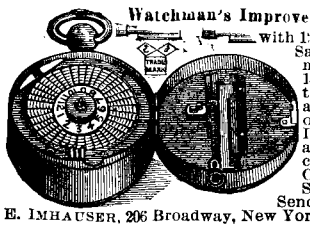
SMALL MOTORS for All Purposes.

The best manufactured. Specially adapted fo all kinds of light work, sewing machine outfits toys, dental drills, jewelers' lathes, models, etc. Send for Catalogue. The LEAVITT MOTOR CO., Manufacturers of Electric Motors and Electrical Specialties, 122 Mitchell St., PROVIDENCE, R. I.

SAVE ½ YOUR FUEL
By using our (stove pipe) RADIATOR.
With its 120 Cross Tubes,
ONE stove or furnace does the work of TWO. Drop postal for proofs from prominent men.
TO INTRODUCE OUR RADIATOR,
the first order from each neighborhood filled at WHOLESALE price, and secures an agency. Write at once.
ROCHESTER RADIATOR COMPANY,
82 Furnace St., ROCHESTER, N. Y.



UNCLE SAM is looking for Bright Young Men
to take the Civil Service Examinations now being held throughout the United States. $1,200 to $2,500 per annum, paid examiners in Patent Office. Full information regarding positions, salaries, dates of examinations, etc. FREE, if you mention the SCIENTIFIC AMERICAN. Write to-day.
Natl. Correspondence Institute,
C. S. Dept. Washington, D. C.



Watchman's Improved Time Detector with 12 or 24 Keys, with Safety Lock attachment. Patented 1875-6-7. My inventions, and will sue all concerns selling or using the Safety Lock attachment, according to Decision of Circuit Court of U. S. for S. D. of N. Y. Send for circulars to
E. IMHAUSER, 206 Broadway, New York. P. O. Box 2875.

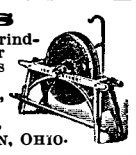
PATENTS!
MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for inventors.
In this line of business they have had *nearly Fifty years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.
A pamphlet sent free of charge on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases. Hints on the sale of Patents, etc.
We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing Patents in all the principal countries of the world.
MUNN & CO., SOLICITORS OF PATENTS,
361 BROADWAY, NEW YORK.
BRANCH OFFICES. — No. 622 and 624 F Street, Pacific Building, near 7th Street. WASHINGTON, D. C.

The Scientific American Reference Book.

A most useful little bound book of 150 pages, comprising, probably, the most extensive variety of standard, practical, condensed information ever furnished to the public for so small a price, only 25 cents.
Among its contents are: The Last Census of the United States (1890), by States, Territories, and Counties; Table of Cities having over 8,000 inhabitants; Map of the United States—miniature outline; The Patent Laws full text); The Trade Mark Law (full text); The Copyright Law (full text); The Principal Mechanical Movements—illustrated by 150 small diagrams—of value to inventors and designers of mechanism; Medallion Portraits of Distinguished American Inventors; Valuable Tables relating to Steam, Electricity, Heat, Metals, Weights, and Measures.
☞ *Sent by mail to any address on receipt of price,* 25 cents.
MUNN & CO., Publishers,
361 Broadway, New York.

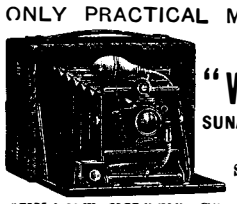
How to Repair Bicycles
An Illustrated Treatise, covering the entire subject, by a practical authority, showing necessary tools and material required. Mailed, postpaid, for 15 cents in stamps.
THE FRASSE CO.,
21 Warren St., New York, N. Y.

EDGE TOOLS
are often nearly ruined by using a grindstone not adapted to the work. Our quarries produce a large variety of grits suitable for grinding any tool.



☞ *May we send you our Catalogue, which will give you some information?*
GRAFTON STONE COMPANY,
No. 80 River Street, GRAFTON, OHIO.

ONLY PRACTICAL MAGAZINE CAMERA



SUNART'S "VENI, VIDI VICI,"
SUNART MAGAZINE,
SUNART FOLDINGS.
Send for Illustrated Catalogue—2 cent stamp.
SUNART PHOTO CO., ROCHESTER, N. Y.

RUST On bright metal surfaces, Machinery, Tools, etc., absolutely prevented by using MANNOCITIN. ENDORSED BY LEADING FIRMS.
Sample Can, 25c., Postpaid. Otto Goetze, 118 Broad St., New York

WANTED—Partner with capital to join inventor experimenting and in taking out foreign patents on Propulsion of Marine Vessels, for which United States patent has been granted For particulars address, Eugene Duerr, 48 East Mohawk St., Buffalo, N. Y.

ESTABLISHED 1845
DUNBAR BROTHERS
MANUFACTURERS OF
STEEL (OIL TEMPERED) SPRINGS
ALL KINDS OF **SMALL SPRINGS** MADE FROM
SHEET STEEL & STEEL & BRASS WIRE.
BRISTOL, CONN. P.O. BOX 416

NEW LONDON WORCESTER, BOSTON, VIA NORWICH LINE 5.30 P.M. FROM PIER 40, N.R., EXCEPT SUNDAYS.
THE INSIDE ROUTE

Chain
BELTING of Various Styles, ELEVATORS, CONVEYORS,
COAL MINING and HANDLING MACHINERY.
The JEFFREY MANUFACTURING CO., COLUMBUS, O.
☞ *Send for late Catalogue "C."* Branches: CHICAGO—NEW YORK.

PROPOSALS.

NEW EAST RIVER BRIDGE COMMISSIONERS' Office, New York, September 1, 1896.—Proposals will be received by the Commissioners of the New East River Bridge, at their office, at No. 49 Chambers Street, New York City, until two o'clock in the afternoon of Wednesday, October 7, 1896, indorsed "Proposals for Construction of Foundations of New York Tower of New East River Bridge," for furnishing the materials for and constructing the foundations of the New York Tower of the New East River Bridge, at or near the foot of Delancey Street, in the City of New York, in accordance with the proposed form of contract and the plans and specifications therefor. All bids shall be inclosed in sealed envelopes addressed to A. D. Baird, President of the Board of Commissioners of the New East River Bridge, and presented to him on that day and at that hour at said office, and such bids will be opened at public meeting by the Commissioners on that day at two o'clock. Copies of the specifications and the general drawings of the work, with the proposed form of bids and contract, may be obtained, and further information will be given at the office of the Chief Engineer, No. 84 Broadway, Brooklyn. Proposals will be made upon a form provided therefor, and only those proposals will be considered which are complete, in proper form, comply with the requirements therein stated, and are offered by parties of known reputation, experience and responsibility. Each bidder will be required to deposit, with his proposal, in the office of the Commissioners, a certified check for $5,000, payable to the order of Richard Deeves, as Treasurer of the New East River Bridge Commissioners, as security for the execution by him of the contract if his bid is accepted. The contractor will be required to give a bond in the penal sum of $125,000, in the form annexed to the proposed form of contract, with two approved sureties or an approved surety company, conditioned for the prompt and faithful performance of the contract and its covenants and the work thereunder. The Commissioners reserve the right to reject any and all of the proposals offered, and to accept any proposal offered. ANDREW D. BAIRD, *President.* F. B. THURBER, *Secretary.*

Light and fine machinery to order; models and electrical work specialty. E. O. CHASE, NEWARK, N. J.

Shorthand by Mail Thoroughly taught by reporters. *Catalogue and first lesson Free.* Potts Shorthand College, Williamsport, Pa.

MAGIC LANTERNS WANTED AND FOR SALE OR EXCHANGE. HARBACH & CO. 809 Filbert St. Phila. Pa.

DIES Models, Tools, Special and General Machinery made to order. Prices moderate. A. GUENARD 32 to 38 South 6th Street, BROOKLYN, N. Y.

STEEL TYPEWRITER TYPE
TYPE WHEELS. MODELS & EXPERIMENTAL WORK. SMALL MACHINERY NOVELTIES & ETC. NEW YORK STENCIL WORKS 100 NASSAU ST. N.Y.

WANTED—Manufacturers to correspond about making Newspaper Holders (for holding newspapers at the breakfast table), just patented. C. E. Dunshee, 3604 Vernon Avenue, Chicago, Ill.

VOLNEY W. MASON & CO.
FRICTION PULLEYS, CLUTCHES, and ELEVATORS
PROVIDENCE, R. I.

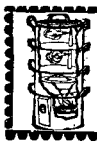
CARBORUNDUM
HARDEST ABRASIVE KNOWN. EMERY AND DIAMOND POWDER SUBSTITUTE. IN FLOUR-POWDER-CRYSTAL-WHEEL-SLAB & HONE FORM.
CARBORUNDUM CO. MONONGAHELA CITY, PA. U.S.A.

DIXON'S 691 CYCLE CHAIN GRAPHITE saves wear of chain, prevents rust and increases ease, speed and comfort.
☞ It will pay you to send 10 cents for sample.
JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

WALKER'S SELF-PULLING CORK SCREW
BEST MADE! NO PULLING REQUIRED!
CUTS THE WIRE. TURNS OUT CORK. BUY OF DEALER OR POST PAID 50¢
ERIE SPECIALTY CO. ERIE, PA. U.S.A.

DO YOU **USE GRINDSTONES?**
If so, we can supply you. All sizes mounted and unmounted, always kept in stock. Remember, we make a specialty of selecting stones for all special purposes. ☞ *Ask for catalogue.*
The CLEVELAND STONE CO.
2d Floor, Wilshire, Cleveland, O.

Complete Course in **BOOKKEEPING** For One Dollar
Best Self-Instructor. ABRAHAMSON'S
BOOKKEEPING CHART
All necessary questions answered by author free by mail. References. Money refunded if not satisfactory. Price $1 to any address.
WARREN DEAN & CO.
233 CLINTON HALL NEW YORK CITY



WANT MONEY?
Easy to make selling BEVERIDGE'S Automatic Cooker. Practical and satisfactory. No scorching, no odor. Saves labor and fuel and fits any stove. Good pay to agents of either sex. 2385 sold in one town. Write (P. O. 728), BEVERIDGE MFG. CO., Baltimore, Md.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.

Best **Drying Machines** for Grain, Sand, Clays, Fertilizers, Green Coffee, Wet Feeds, etc 15 Years in operation. *Send for 6th illustrated catalogue.*
S. E. WORRELL, Hannibal, Mo.

R. POOLE & SON CO.'S
ENGINEERS, FOUNDERS AND MACHINISTS,
BALTIMORE, MD.
MANUFACTURERS AND DESIGNERS OF ALL KINDS OF
HEAVY MACHINERY,
REQUIRING FIRST CLASS WORKMANSHIP AND MATERIALS.
BAND, ROPE AND FLY WHEELS. FRICTION CLUTCHES. PULLEYS. SHAFTING AND HANGERS.
MACHINE MOLDED AND PLANED GEARING.
POOLE-LEFFEL TURBINE WATER-WHEELS.
CIRCULARS ON APPLICATION.

© 1896 SCIENTIFIC AMERICAN, INC.

Advertisements.

ORDINARY RATES.

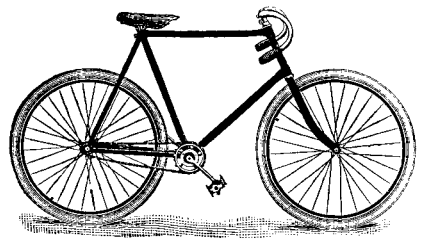
Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

Tribune Bicycle

Tested and True.



The Easiest Running Wheel in the World.

☞ *Send for Catalogue.*

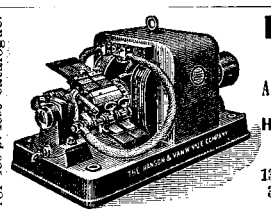
THE BLACK MFG. CO., ERIE, PA.

Typewriter Patent

This company owns Letters Patent No. 558,428, issued April 14, 1896, covering broadly all machines in which the cylinder turns up to expose the line of print, or in which a duplex or cross ribbon feed is used. The patent also covers many other features of modern typewriter construction. Infringers will be vigorously prosecuted.

Wyckoff, Seamans & Benedict.
327 Broadway, New York.

Send your business card for 150 p. 1896 catalogue.



NICKEL AND **Electro-Plating** Apparatus and Material.
THE **Hanson & VanWinkle Co.,**
Newark, N. J.
136 Liberty St., N. Y.
35 & 37 S. Canal St., Chicago.

THE BICYCLE: ITS INFLUENCE IN Health and Disease.—By G. M. Hammond, M.D. A valuable and interesting paper in which the subject is exhaustively treated from the following standpoints: 1. The use of the cycle by persons in health. 2. The use of the cycle by persons diseased. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1002. Price 10 cents. To be had at this office and from all newsdealers.

AGENTS WANTED WRITE FOR CATALOGUE AND AGENCY. **FOR FINE TOOLS IN EVERY SHOP. C.H.BESLY & CO. CHICAGO, ILL. U.S.A.**

The American Bell Telephone Company,

125 Milk Street,
Boston, Mass.

This Company owns Letters-Patent No. 463,569, granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, covering all forms of Microphone Transmitters or contact Telephones.

The No. 2 Hammond

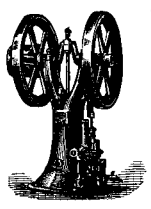
Possesses

ALIGNMENT—Perfect and permanent
IMPRESSION—Invariably uniform.
TOUCH—Soft, light and elastic.
SPEED—206 words a minute.
DURABILITY—The fewest parts and best made
VARIETY—12 languages, 37 styles of type, paper or cards of any width or size on one machine.
PORTABILITY—Weighs only nineteen pounds complete, with traveling case.

THE HAMMOND TYPEWRITER CO., - 401 East 62d Street, - NEW YORK

HAVE YOU GOT OUR CATALOGUE L FOR 1896 OF
GAS AND GASOLINE STATIONARY ENGINES
GASOLINE TRACTION ENGINES
COMBINED ENGINES AND PUMPS
GASOLINE PORTABLE ENGINES
USED ANY PLACE BY ANY ONE FOR ANY PURPOSE
CHARTER GAS ENGINE CO., Box 148, Sterling, Ill.

At ¼ Price Bicycles, Watches Guns, Buggies Harness, Sewing Machines Organs Pianos Safes, Tools Scales of all varieties and 1000 other articles Lists free. CHICAGO SCALE CO., Chicago Ill.



This beats Wind, Steam, or Horse Power. We offer the **WEBSTER 2½ actual horse power GAS ENGINE** for $150, less 10% discount for cash. Built on interchangeable plan. Built of best material. Made in lots of 100 therefore we can make the price. Boxed for shipment, weight 800 pounds. Made for Gas or Gasoline.

☞ *Write for Special Catalogue.*

WEBSTER M'F'G CO.,
1074 West 15th Street, CHICAGO.

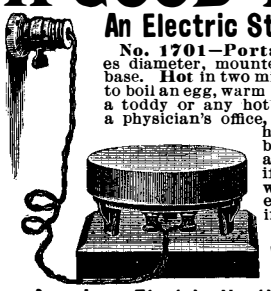
DAMON-PEETS CO., 44 Beekman St., N. Y. are the Eastern Agents for the **WEBSTER GAS AND GASOLENE ENGINES**
They keep all sizes in stock, and can show them in operation. ☞ *Catalogues free.*

PREISTMAN SAFETY OIL ENGINE

"A thoroughly successful commercial Engine using a Safe Oil."—Franklin Institute

No Extra Insurance. No Steam, No Gas. No Gasoline. Reliable, Safe, Economical, and Convenient. Chosen by Nine Governments. Used for nearly every purpose.
PREISTMAN & CO., Incorp'd,
530 Bourse Bldg., PHILADELPHIA, PA.

A GOOD THING
An Electric Stove for $4.00



No. 1701—Portable Stove—4½ inches diameter, mounted on enameled slate base. **Hot** in two minutes. Just the thing to boil an egg, warm the baby's milk, make a toddy or any hot drink. Suitable for a physician's office, sick room, apartment houses. Packed one in a box complete with cord and plug ready for use, if you *state voltage* and whether the lamp sockets are Edison, Westinghouse, or T.-H.

Send for one and try it.

WE MAKE THE BEST CAR HEATERS.

American Electric Heating Corporation,
GENERAL OFFICE: Sears Building, Boston.
BRANCH OFFICES Havemeyer Bldg., New York Monadnock Bldg., Chicago.

Nickel Silver Watches

We are casing all sizes of movements in this new metal. It takes a better finish and is more enduring than sterling.

It supersedes the old nickel plate, and enables one to have a perfect timepiece at small cost.

Our Solid Gold and Filled Cases, as well as Sterling Silver and Enameled patterns, are in greater variety this season than ever.

New specialties have been added.

Our '97 Model

Trump Cyclometer,

the 10,000 mile wheel recorder, are all shown in our new catalogues, which will be sent to all.

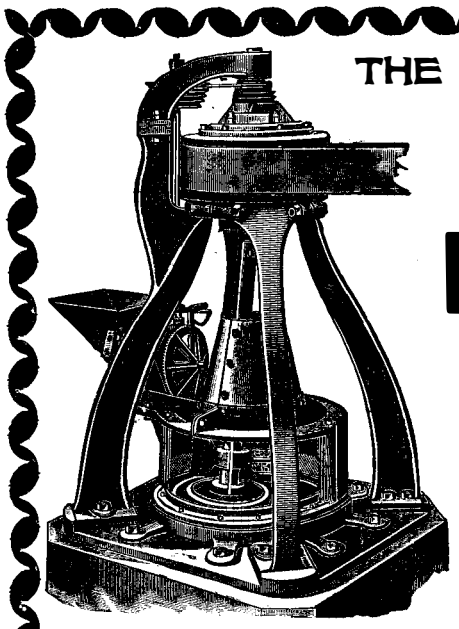
The Waterbury Watch Co.
WATERBURY, CONN.

The $5.00 POCKET KODAK

EASTMAN KODAK CO.,
Sample photo and booklet for two 2-cent stamps. ROCHESTER, N. Y.

THE ACKNOWLEDGED

PERFECT PULVERIZER



Of All Refractory Substances

Is the **"Griffin Mill,"** whose first cost, wear, and operating expense is much less than stamp mills, and which yields a larger product at less cost than any other mill, with perfect success in every instance.

It will work by either the wet or dry process, and deliver a uniformly sized finished product of from 30 to 350 Mesh, with equal facility. Its capacity is 3 to 4 tons per hour on Phosphate Rock, 1½ to 2 tons per hour on Portland Cement, Quartz Ores, etc.

Correspondence solicited, and illustrated descriptive catalogue sent free by mail on application to

Bradley Pulverizer Co., No. 92 State Street, Boston.

INVENTORS OF SPORTING SPECIALTIES WILL FIND IT OF ADVANTAGE TO CORRESPOND WITH AND SUBMIT THEIR ARTICLES TO H. P. O. BOX 2308 NEW YORK.

WEBER'S PATENT HOT WATER BAG

made suitable for all purposes; can be converted into foot receptacle or fitted to any part of the body with comfort. Indorsed by leading physicians. If your druggist hasn't it write for descriptive circular with full particulars free.

☞ *Agents wanted.*

Jahant & Weber, 160 S. Howard St., Akron, Ohio.

HALF A CENTURY OF CYCLES.—AN interesting history of the cycle from its origin up to the present time. The first crank-driven bicycle. The "bone-shaker" and its successors. The tricycle. The modern wheel. Cycle building a science. Points of improvement. The pneumatic tire. A hand and foot cycle. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1012. Price 10 cents. To be had at this office and from all newsdealers.

The Photo-Engravings

(Half-tone and Line work) in
"The Scientific American,"
"Puck,"
and other leading periodicals, are made by
The MOSS Photo-Engraving Co.
273 & 275 Mulberry Street, New York.
The Pioneer Photo-Engraving Establishment in the United States.
☞ *Write for Prices and Specimens.*

Andrew H. Kellogg

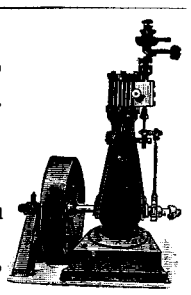
409, 411, 413, 415 Pearl Street, New York

Printer

***Special Facilities** for the production of all kinds of Catalogue Work*

Long Distance Telephone, 2601 Cortlandt

GREENFIELD Steam Engine Works.



Established 1874.
Manufacturers of Greenfield Stationary, Portable and Yacht
ENGINES AND BOILERS.
Also Horizontal, Automatic and Variable Cut-off Engines.
Sizes from 3 to 75 Horse-Power.
Also Vertical and Horizontal and Marine Boilers, Steam Pumps and Adams' Grate Bars.
W. G. & G. GREENFIELD, East Newark, N. J.

ICE MACHINES, Corliss Engines, Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC. WM JESSOP & SONS LD 91 JOHN ST. NEW YORK

PRINTING INKS
The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

© 1896 SCIENTIFIC AMERICAN, INC.